FOR CONTRACT NO.: **06-447704**

INFORMATION HANDOUT

SUPPLEMENTAL MATERIALS INFORMATION

GEOTECHNICAL DESIGN REPORT, DATED DECEMBER 8, 2006

GEOTECHNICAL DESIGN REPORT FOR SOUND WALL AND SOUND WALL ON RETAINING WALL, DATED APRIL 20, 2007

GEOTECHNICAL RECOMMENDATIONS, DATED NOVEMBER 14, 2007

SUPPLEMENTAL RECOMMENDATIONS TO GEOTECHNICAL DESIGN REPORT, DATED JANUARY 21, 2010

DRAINAGE AGREEMENT (DISTRICT AGREEMENT No. 06-1419)

ROUTE: 06-Fre-41-R29.8/R30.4

CONTRACT NO. 06-447704
ADDED PER ADDENDUM NO. 1 DATED FEBRUARY 26, 2010

State of California
Department of Transportation

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MR. JACK R. WALKER
Senior Design Engineer, Branch M
Office Design I

Attention: Jose Bautista

Date: December 8, 2006

File: 06-FRE-41-PM R29.5/R30.5
EA: 06-447700
Herndon Auxiliary Lane

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES – MS 5

Subject: Geotechnical Design Report

Introduction

Per your request, we are providing a Geotechnical Design Report (GDR) for the Herndon Auxiliary Lane on State Route 41 from Bullard Ave to Herndon Ave, located in the city of Fresno, California. The project proposes to construct a northbound auxiliary lane on State Route 41 from the Bullard Ave on-ramp to the Herndon Ave off-ramp and to widen the off-ramp with an additional lane. The purpose of this report is to document geotechnical conditions and to make geotechnical recommendations for retaining wall construction, roadway widening, cut slope stability, and the potential seepage condition from the FMFCD basin "N" located between Bullard Avenue and Sierra Avenue. A Location Map is presented as Plate 1.

Existing Facilities and Proposed Improvements

At the project location, State Route 41 consists of a six-lane divided highway paved with asphalt concrete through mostly residential and business areas built in cuts and aligned in a general north/south direction. Numerous utilities cross the site, both above and below ground.

The District plans to improve the traffic operation of northbound SR 41 between Bullard Avenue and Herndon Avenue, and the northbound off-ramp to Herndon Avenue by constructing an auxiliary lane on Route 41 and widening on off-ramp to Herndon Avenue.

Pertinent Reports and Investigations

The following documents, reports and maps were reviewed to assist in the assessment of site

conditions:

- *California Seismic Hazard Map 1996*, Caltrans, dated 1966, by Lalliana Mualchin.
- *Geologic Map of California, Fresno Sheet*, compilation by Robert A. Matthews and John L. Burnett, dated 1965, published by CDMG.
- Draft Project Report for Auxiliary lane on NB SR 41 from Bullard Ave to Herndon Ave, Fresno, dated October 2006 prepared by the Office of the District 6.
- Memorandum for Drill Rig Hammer Evaluation dated December 7, 2005 prepared by the Office of Foundation Testing Branch.
- Memorandum for Concerns of Ability of West Bank of FMFCD Basin "N" to Retain Max. Storm Water Capacity, dated November 4, 1988 prepared by District 6 Hydraulics.

Physical Setting

Climate

According to the Western Regional Climate Center, Fresno Weather Service Office- Airport, California for Monthly Climate Summary from July 01, 1948 to December 31, 2005, the average annual precipitation at Fresno is about 10.94 in. The majority of this precipitation falls between November and April. The average annual air temperature is approximately 76.4°F with average monthly extremes of 37.2°F in December and 98.1°F in July.

Topography & Drainage

According to the layouts L1, L2, L3 and L4 dated 08/16/06 of the District Design, the site elevation varies between 311 to 343 feet above mean sea level. Within the project boundaries, the ground elevation ascends gradually from the south-end to the north end by 32 feet. No significant natural drainage is present in the project area.

Regional Geology

This project is located on the southern part of the Great Valley geomorphic province of California. The Geologic Map of California, Fresno Sheet (1966), indicates that the soil present in the entire area is Quaternary age sediments consisting of fan deposits (Qf), and nonmarine sedimentary deposits (Qc). Pleistocene nonmarine sedimentary deposits (Qc) consisting of granitic sand, silt, and clay underlie the majority of the project site. The "Qc" unit normally underlies the "Qf" unit. The eastern areas beyond the project limits are founded

on Mesozoic granitic rocks, Mesozoic ultrabasic intrusive rocks, and Pre-Cretaceous metasedimentary rocks and/or metavolcanic rocks. (See Plate 2)

Seismicity

Based upon the Department's California Seismic Hazard Map, dated 1996, the controlling fault is the Coast Ranges-Sierran Block Boundary Zone (CSB, Reverse including thrust) with a maximum credible earthquake moment magnitude of M_w= 7. The CSB is located about 50 miles southwest of the site. The Peak Horizontal Bedrock Acceleration is estimated to be 0.2g. The potential for surface rupture at the site due to fault movement is considered insignificant since there are no known faults projecting towards or passing directly through the project site. (See Plate 3)

Groundwater

Groundwater was not encountered at the time of field investigation. A monitoring well was installed to the depth of 81.5 feet in Boring B-06-02 upon drilling completion in order to check groundwater seepage from the FMFCD Drainage Basin "N". However, groundwater and seepage was not observed on 8/29/06 and 9/25/06.

Based on the DWR historical well data within the period of 1971 and 2005, the average groundwater elevation within the project site is approximately 210 feet which would correspond to approximately 100 feet below the ground surface.

Field Exploration

A subsurface investigation was conducted for this project during the week of August 28, 2006 and advanced using a CME 750 with 6.5-inch (OD) hollow stem augers. Soil samples were collected in each boring using Standard Penetration Testing at approximately 5 feet intervals. For geotechnical design application, an adjustment factor of 1.36 for field N-value was adopted from the memorandum for Drill Rig Hammer Evaluation dated December 7, 2005 prepared by the Office of Foundation Testing Branch. Locations of the borings are illustrated on Plate 4 and logs of the borings are presented as Appendix A. Table 1 presents a summary of investigated borings. Station, Offset, Elevation and Depth are approximations.

Table 1: Summary of Borings

Boring	Station	Offset From "A" Line (Ft)	Elevation (Ft)	Drilled Depth (Ft)	Remarks
B-06-01	1579+47	60 Rt.	333.0	61.5	
B-06-02	1583+41	54 Rt.	334.0	81.5	Monitoring well
B-06-03	1587+35	55 Rt.	335.0	61.5	
B-06-04	1596+86	56 Rt.	336.0	61.5	
B-06-05	1603+42	36 Rt.	335.0	61.5	

Laboratory Testing

Laboratory testing was performed on seven soil samples from the borings. Soil samples were analyzed to determine five gradation and two corrosion tests. Results of the gradation laboratory testing are presented in Plate 5.

Based on the results from the corrosion testing of soil samples collected in Borings B-06-02 and B-06-04, the native soils beneath the site are considered non-corrosive based on Departmental guidelines.

Subsurface Conditions

Based on our subsurface investigation performed in August 2006, the soil present at the site is composed of interbedded layers of medium dense to very dense sand, medium dense to dense silty sand, and stiff to hard silt. Bedrock was not encountered within the maximum depth drilled during our investigation. Complete boring logs are presented in Appendix A.

Geotechnical Recommendations

The following geotechnical recommendations are based on the Project Layout Plans, information provided by District 6 Design, and the subsurface investigation conducted at the site. The geotechnical considerations discussed in this report are limited to District retaining walls. The recommendation for a possible tie-beck retaining wall structure under the Sierra

Avenue OC (Br. No. 42-0304) will be addressed in a separate foundation report, and will be submitted to the Office of Structure Design.

Retaining Wall

We understand that the District has planned to construct a retaining wall on Type 5 within the limits between Sta. 1576+00 and Sta. 1603+00. Based on Borings from our current field investigation, the proposed retaining wall may be constructed using a spread footing foundation as detailed in the Standard Plan B3-7 Sheets, dated May 2006.

The wall height used in our analyses was 10 feet. The bearing capacity was determined using a spread footing with a width 8 feet and lengths of 2700 feet. The retaining wall meets the condition of Case II (2H:1V unlimited) and the foundation material meets the requirements as per the Standard Plan B3-7, May 2006. An allowable bearing capacity of 4.2 ksf (200 kPa) is recommended. The detail of Type 5 retaining wall is shown in Figure 1.

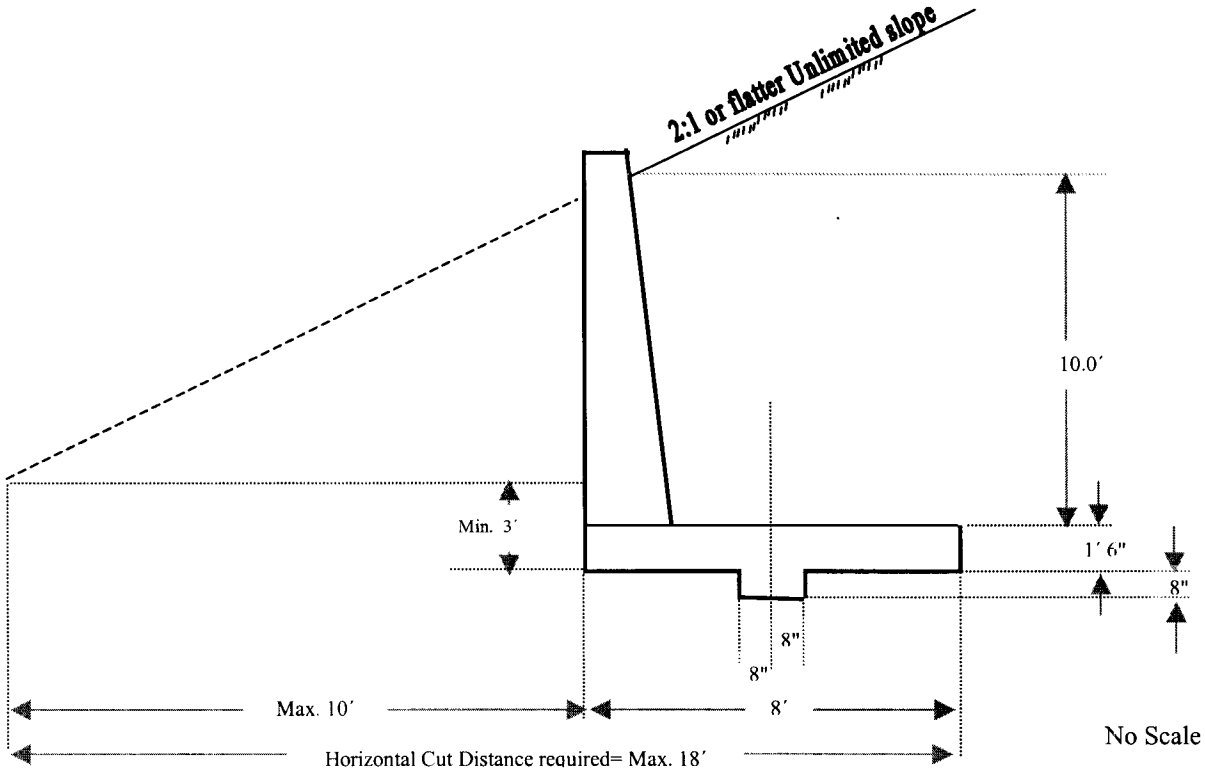


Figure 1. Retaining Wall Detail (Type 5)

We recommend that spread footing be to be founded on compacted (95% relative compaction) structural backfill extending two foot below bottom of footing.

Roadway Construction

Based upon the cross sections provided, cut and fill slopes may be constructed at 2:1 (H:V) or flatter. We expect the slope to be stable at these angles. However, as the majority of the cut and fill slopes will consist of silty sand and sandy soils, erosion is a concern. We recommend that erosion control measures be applied at all disturbed soil locations. For erosion control, the Office of Landscape Architect shall be consulted.

Seepage from FMFCD Basin

Based on groundwater observation from monitoring well installed in Boring B-06-02, groundwater and seepage were not encountered within the limit of a drilled depth of 81.5 feet. Referring to the memorandum for "Concerns of Ability of West Bank of FMFCD Basin "N" to Retain Max. Storm Water Capacity" dated November 4, 1988 prepared by District 6 Hydraulics, groundwater depth reading were taken by sounding tubes at 72′, 97′ and 136′ right of the SR 41 centerline Sta. 1581+69 during the period of August 14, 1984 to August 21, 1984. The results of water depth soundings indicated that horizontal saturation of the bank did not occur above the level of the freeway design and finish grade elevation. Therefore we anticipate that the groundwater seepage from the FMFCD Basin "N" may not affect the proposed cut into the existing slopes. (Assumed max. 18 feet horizontal cut into existing slope)

Construction Considerations

1. The footings shall be embedded at a sufficient depth (min. 3 feet to the bottom of footing) as required in Section 4 Foundations, Article 4.4.5.1 of the Caltrans Bridge Design Specifications, November 2003.

2. The backfill placed behind the retaining wall should meet the structure backfill requirements set forth in the standard specifications and standard plans. Backfill and compaction of depressions and pits created from clearing and grubbing at the base of the footings shall also conform to the requirements of the standard specifications.

3. It is anticipated that temporary excavation will be required for the retaining wall. In lieu of temporary cut slope, temporary shoring maybe utilized to reduce the excavation area. Design of temporary cut and/or installation of temporary shoring should be the responsibility of the contractor. Temporary excavations should comply with the State of California Safety Orders (CAL/OSHA).

Project Information

Standard Special Provision S5-280, "Project Information", discloses to bidders and contractors a list of pertinent information available for their inspection prior to bid opening. The following is an excerpt from SSP S5-280 disclosing information originating from Geotechnical Services. Items listed to be included in the Information Handout will be provided in Acrobat (.pdf) format to the addressee(s) of this report via electronic mail.

Data and information attached with the project plans are:

A. None

Data and Information included in the Information Handout provided to the bidders and Contractors are:

A. Geotechnical Design Report for the Herndon Auxiliary Lane, Dated 12/08/2006

Data and Information available for inspection at the District Office:

A. None

Data and Information available for inspection at the Transportation Laboratory are:

A. None

The recommendations contained in this memorandum are based on specific project information regarding structure type, location, and design approaches that have been provided by the District. If any conceptual changes are proposed during final project design, the Office of Geotechnical Design North should review those changes to determine if the recommendations contained herein are still applicable.

If you have any questions or comments, please contact Myo Naing at (916) 227-7233 or John Huang at (916) 227-7237.

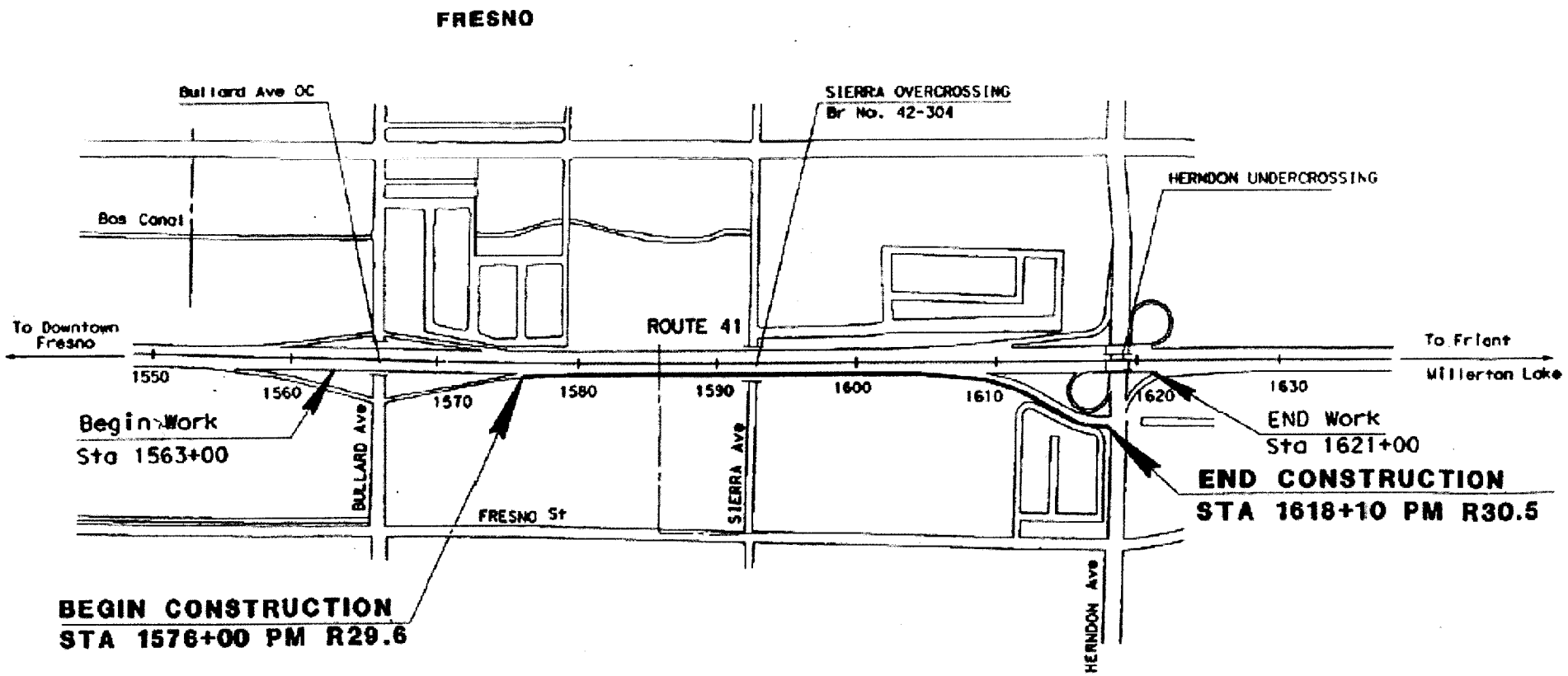
MYO NAING
Engineering Geologist
Office of Geotechnical Design – North
Branch E

JOHN (QIANG) HUANG, PE
Senior Material & Research Engineer
Office of Geotechnical Design – North
Branch E

Attachments

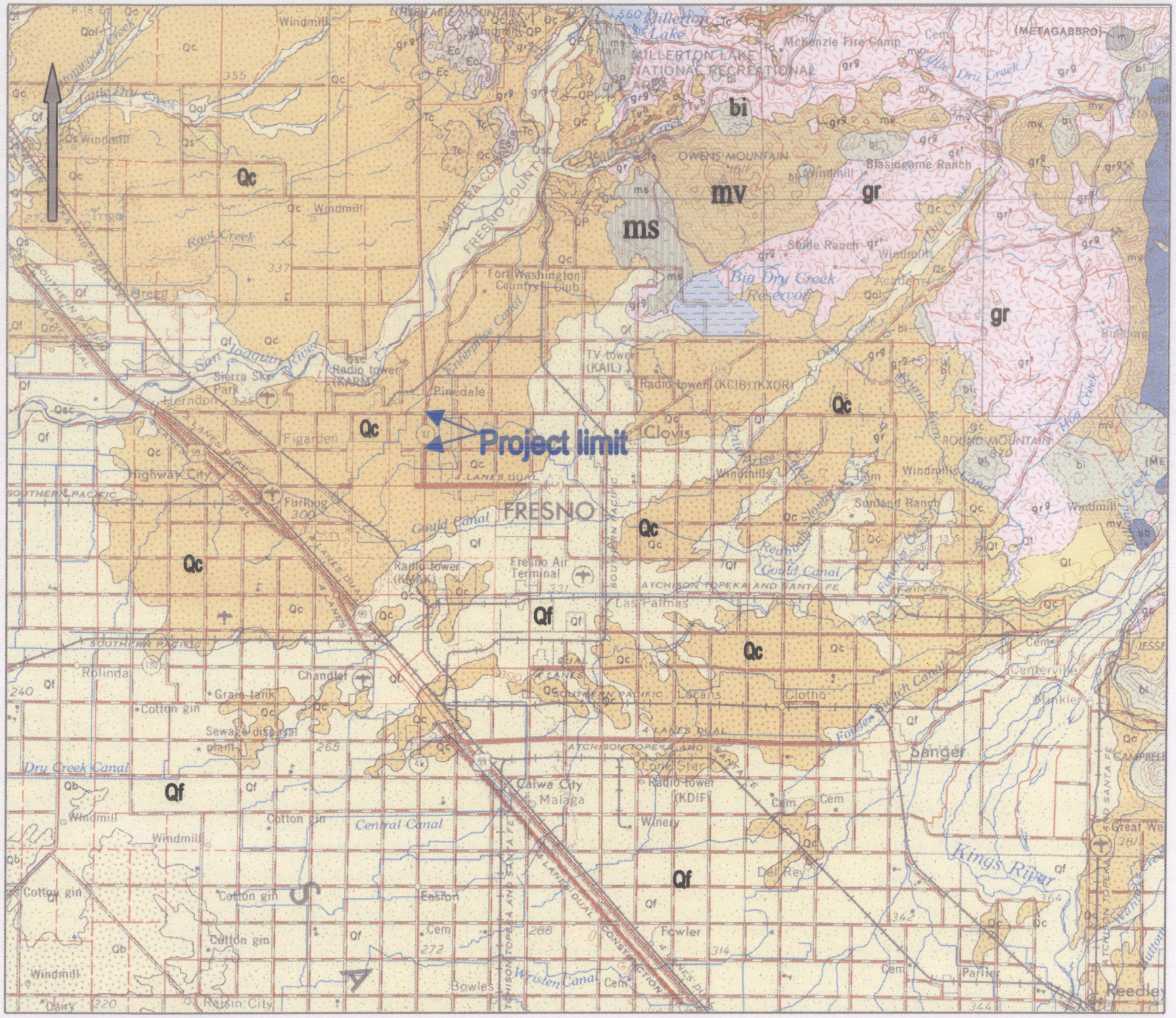
c: RonSekhon (E-copy)
GDN File

List of Attachments



NO SCALE

CALTRANS Division of Engineering Services Geotechnical Services Office of Geotechnical Design -North	EA: 06-447701 December 2006	**LOCATION MAP** HERNDON AUXILIARY LANE
	06-FRE-41-PM R29.5/R30.5 **GEOTECHNICAL DESIGN REPORT**	Plate 1



EXPLANATION

Qf	Fan deposits
Qc	Pleistocene nonmarine sedimentary deposits
gr	Mesozoic granitic rocks
bi	Mesozoic basic intrusive rocks
mv	Pre-cretaceous metavolcanic rocks
ms	Pre-cretaceous metasedimentary rocks

Scale: 1:250,000

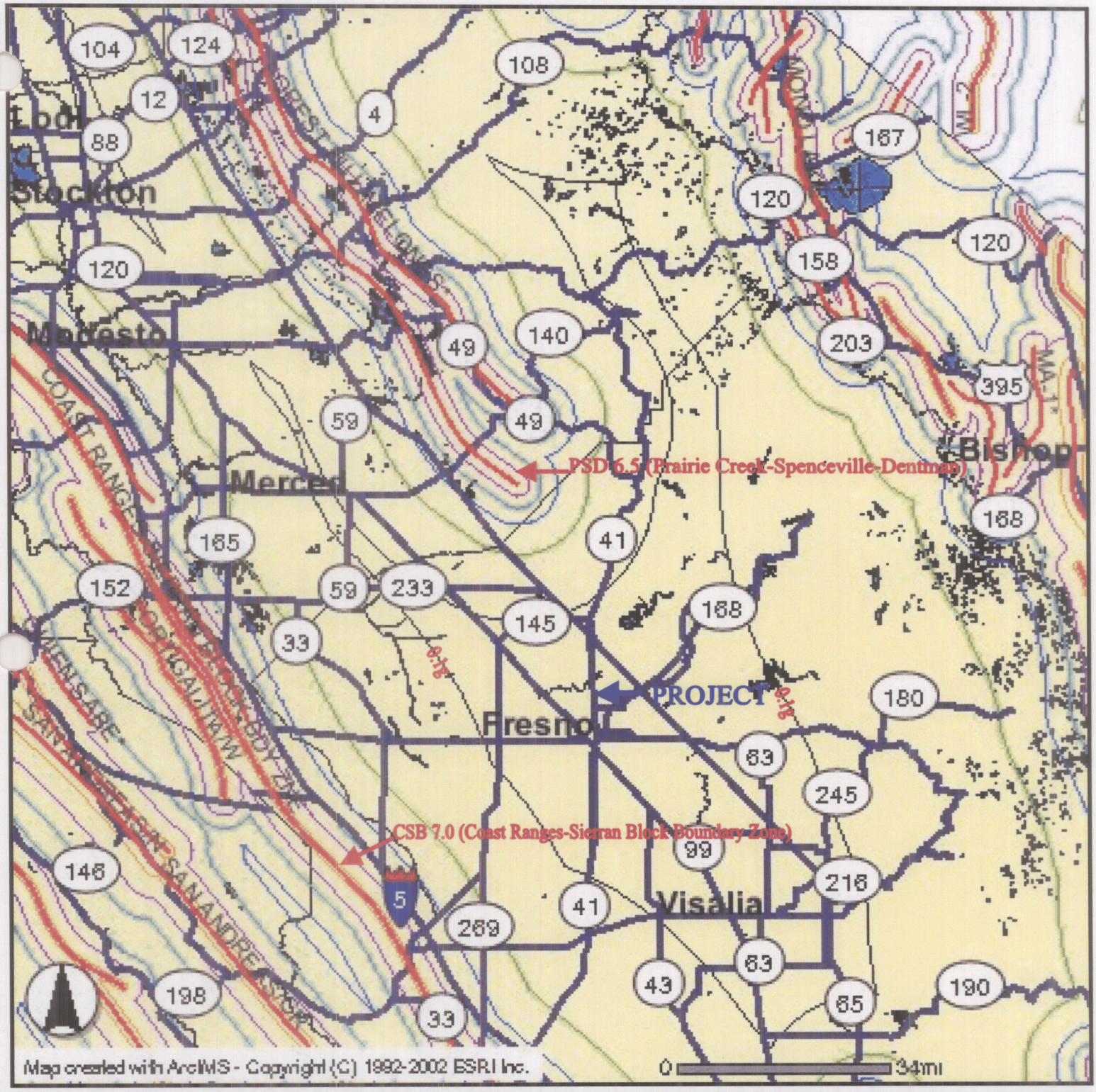
CALTRANS
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design North

EA: 06-447700
December 2004

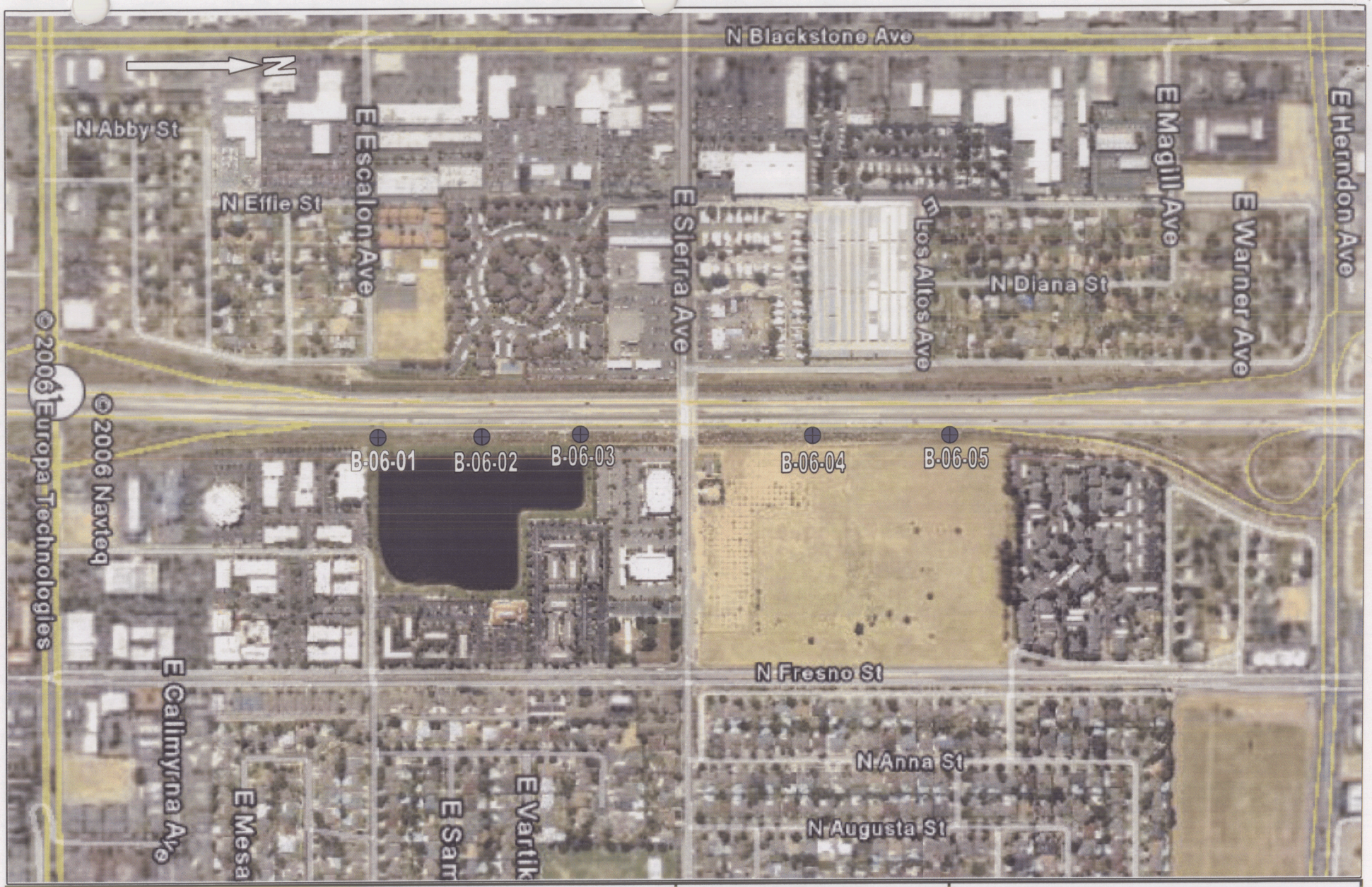
REGIONALGEOLOGIC MAP
HERNDON AUXILIARY LANE

06-FRE-41-PM R29.5/R30.5
GEOTECHNICAL DESIGN REPORT

Plate 2

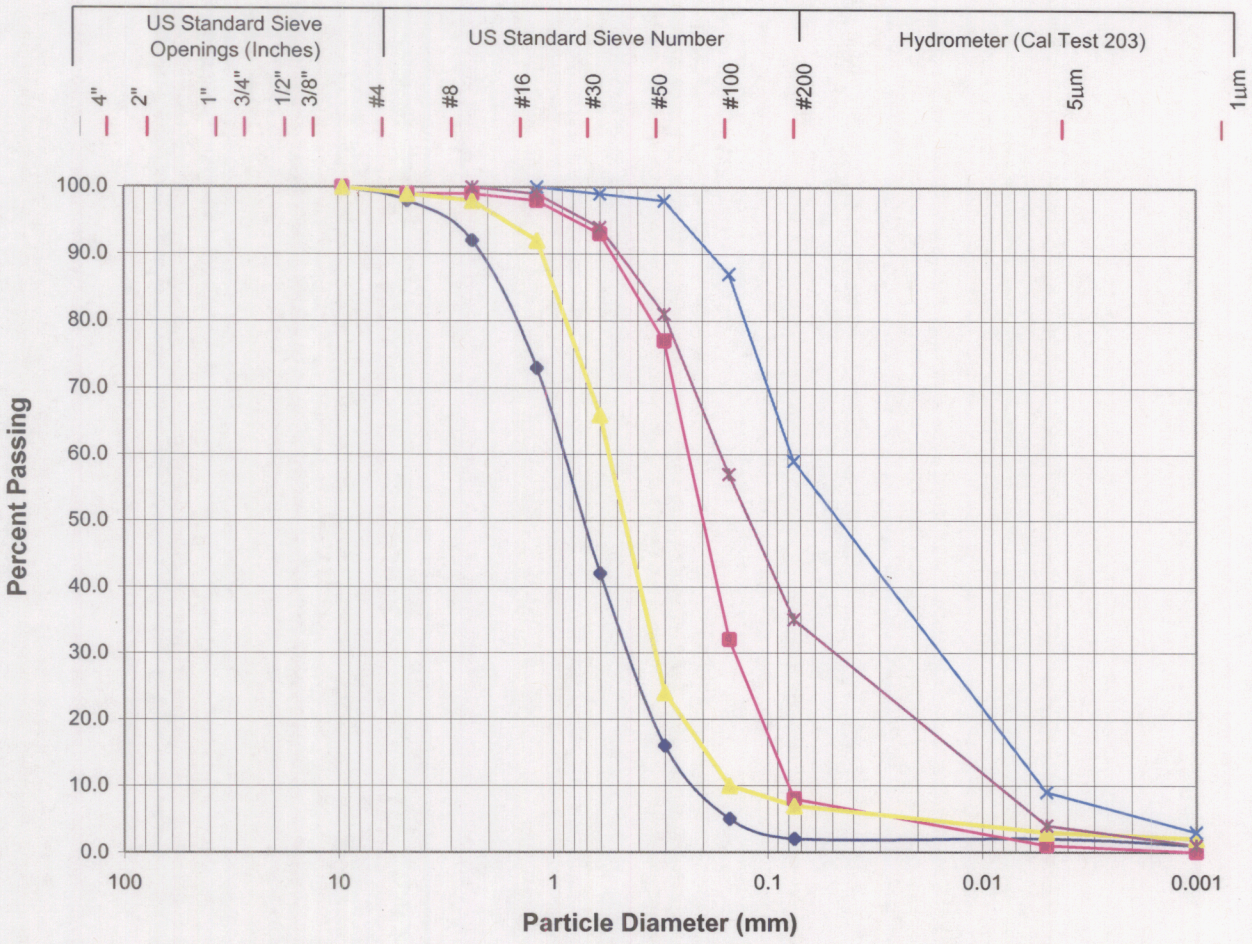


CALTRANS Division of Engineering Services Geotechnical Services Office of Geotechnical Design North	EA: 06-447700 December 2006	SEISMIC HAZARD MAP HERNDON AUXILIARY LANE
	06-FRE-41-PM R29.5/R30.5 GEOTECHNICAL DESIGN REPORT	Plate 3



CALTRANS Division of Engineering Services Geotechnical Services Office of Geotechnical Design -North	EA: 06-447701 December 2006	**BORING LOCATION MAP** HERNDON AUXILIARY LANE
	06-FRE-41-PM R29.5/R30.5 **GEOTECHNICAL DESIGN REPORT**	Plate 4

Gradation Analysis Test Results



GRAVELS		SANDS			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

B-06-02-S#03
B-06-02-S#08
B-06-02-S#11
B-06-02-S#13
B-06-02-S#15

Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design North

Project:	Herndon Auxiliary Lane
EA:	06-447700
D.-Co.-Rt.-:	06-FRE-41-PM R29.5/R30.5
Test Date:	Oct. 13, 2006

Plate 5

APPENDIX A

LOGS OF BORINGS

GRAPHIC SYMBOLS


Bulk Sample


Rock Core


Modified California Sampler


Standard Penetration Sampler


Shelby Tube


Vane Shear


Auger


Diamond Core


Rotary


California Sampler


Water Level - 1st Reading

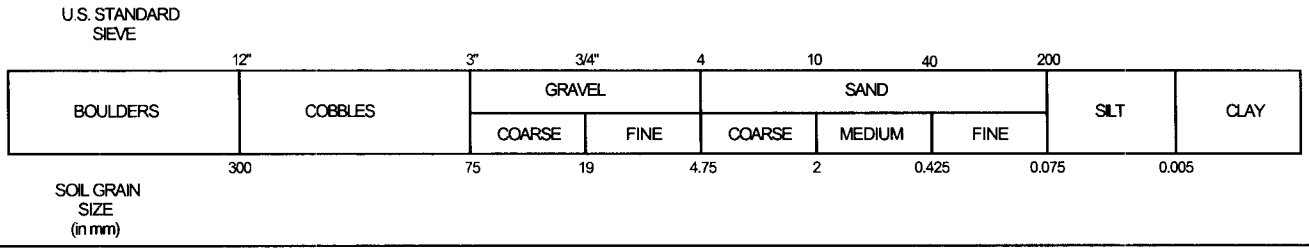

Water Level - 2nd Reading


Water Level - 3rd Reading

TESTING

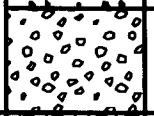
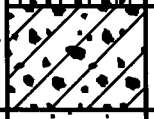
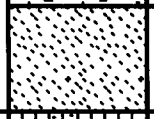
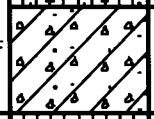
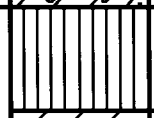
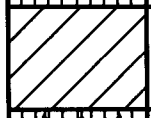
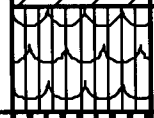
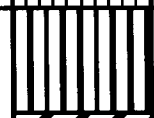
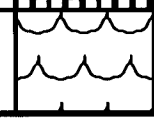
CONS	Consolidation (Cal Test 219)	RQD	Rock Quality Designation (ASTM D6032)
UU	Unconsolidated Undrained Triaxial (Cal Test 230)	CP	Compaction Test (Cal Test 216)
CU	Consolidated Undrained Triaxial (Cal Test 230)	PERM	Permeability (Cal Test 220)
DS	Direct Shear (ASTM D3080)	COR	Corrosivity Testing (Cal Test 532/643)
UC	Unconfined Compression (Cal Test 221)	GRAD	Gradation Analysis (Cal Tests 202/203)
LL	Liquid Limit-% (Cal Test 204)	EP	Expansion Pressure (Cal Test 354)
PI	Plasticity Index-% (Cal Test 204)	OC	Organic Content-% (ASTM D2974)
PP	Pocket Penetrometer	SE	Sand Equivalent (Cal Test 217)
TV	Pocket Torvane		

SOIL GRAIN SIZE



GENERAL NOTES

1. Logs represent general subsurface conditions observed at the point of exploration on the date indicated.
2. In general, USCS designations presented on logs were established by visual methods only; therefore, actual designations (based on laboratory tests) may vary.
3. No warranty is provided as to the continuity of soil conditions between individual sample locations.
4. Lines separating strata on the logs represent approximate boundaries only; actual transitions may be different or gradual.
5. Pocket penetrometer values reported on the logs under shear strength are actual values as recorded in the field. (To be used in analysis, the pocket penetrometer value should be divided by two)

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

Equipment:	Station/KP:	Boring ID.:
CME 750	~1579+47	B-06-01
Hammer:	**Offset Distance/Line:**	**Date Completed:**
Safety automatic drop (140#/ 30")	60'Rt./"A" Line	8-29-06
Drilling Method:	**North/East:**	**Hole Diameter:**
6.5-inch hollow stem auger		6.5in
Sampling Method:	**Ground Surface Elevation:**	**Total Depth:**
SPT, Bulk	~333.0ft	61.5ft
Notes:	**Depth to GW/date measured:**	**Logged By:**
	No groundwater encountered on 8-29-06	Myo Naing

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (pcf)	Shear Strength (tsf)	Drilling Method/ Casing	Remarks
101.19	0.30	1		SILTY SAND (SM): medium dense, light brown, dry, fine to medium sand, nonplastic.											
100.89	0.61	2													
100.58	0.91	3													
100.28	1.22	4													
99.97	1.52	5													
99.67	1.83	6			X	1	10 10 6	16							Adjustment factor of 1.36 was used for correction of field N-values shown in column "Blows per Foot". (Reference to Memo "Drill Rig Evaluation" dated Dec. 2005.)
99.36	2.13	7		SILTY SAND (SM): medium dense, yellowish brown, dry, fine to medium sand, nonplastic.											
99.06	2.44	8													
98.76	2.74	9													
98.45	3.05	10													
98.15	3.35	11			X	2	3 3 6	9							
97.84	3.66	12		SILTY SAND (SM): medium dense, yellowish brown, dry, fine to coarse sand, nonplastic.											
97.54	3.96	13													
97.23	4.27	14													
96.93	4.57	15													
96.62	4.88	16			X	3	2 4 6	10							
96.32	5.18	17		Well-graded SAND (SW): medium dense, yellowish brown, dry, fine to coarse sand, nonplastic.											
96.01	5.49	18													
95.71	5.79	19													
95.40	6.10	20													
95.10	6.40	21			X	4	4 6 7	13							
94.79	6.71	22		SILTY SAND (SM): medium dense, yellowish brown, dry, fine sand, nonplastic.											
94.49	7.01	23													
94.18	7.32	24													
93.88	7.62	25													
93.57	7.92	26			X	5	7 10 8	18							
93.27	8.23	27		SILTY SAND (SM): medium dense, light grey, dry, fine sand, nonplastic.											
92.96	8.53	28													
92.66	8.84	29													
92.35	9.14	30													

(continued)

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (pcf)	Shear Strength (tsf)	Drilling Method/ Casing	Remarks
92.05	9.45	31		SILTY SAND (SM): medium dense, light grey, dry, fine sand, nonplastic. *(continued)*	X	6	5 8 8	16							
91.74	9.75	32		SANDY SILT (ML): very stiff, yellowish brown, moist, low plasticity.											
91.44	10.06	33													
91.14	10.36	34													
90.83	10.67	35													
90.53	10.97	36		Poorly graded SAND (SP): medium dense, yellowish brown, dry, fine to medium sand, nonplastic.	X	7	3 7 7	14							
90.22	11.28	37													
89.92	11.58	38													
89.61	11.89	39													
89.31	12.19	40													
89.00	12.50	41			X	8	4 8 10	18							
88.70	12.80	42		Well-graded SAND (SW): medium dense, yellowish brown, dry, fine to coarse sand, nonplastic.											
88.39	13.11	43													
88.09	13.41	44													
87.78	13.72	45													
87.48	14.02	46			X	9	5 7 8	15							
87.17	14.33	47		Well-graded SAND with GRAVEL (SW): dense, yellowish brown, moist, fine to coarse sand, nonplastic.											
86.87	14.63	48													
86.56	14.94	49													
86.26	15.24	50													
85.95	15.54	51			X	10	7 13 10	23							
85.65	15.85	52		Well-graded SAND with GRAVEL (SW): very dense, yellowish brown, moist, fine to coarse sand, nonplastic.											
85.34	16.15	53													
85.04	16.46	54													
84.73	16.76	55													
84.43	17.07	56			X	11	4 12 18	30							
84.12	17.37	57		SILT (ML): hard, yellowish brown, moist, low plasticity.											
83.82	17.68	58		Well-graded SAND (SW): dense, yellowish brown, moist, fine to coarse sand, nonplastic.											
83.52	17.98	59													
83.21	18.29	60													
82.91	18.59	61			X	12	6 10 14	24							
82.60	18.90	62		Bottom of Hole at 18.75 m (61.5 ft) on 8-29-06											
82.30	19.20	63													
81.99	19.51	64													
81.69	19.81	65													
81.38	20.12	66													

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

EA:	06-447700
Date:	11-21-06
Drafted By:	Myo Naing

B-06-01

06-FRE-41 / KP 47.48/49.08 (PM 29.5/30.5)

Geotechnical Design Report

Equipment:	Station/KP:	Boring ID.:
CME 750	~1583+41	B-06-02
Hammer:	**Offset Distance/Line:**	**Date Completed:**
Safety automatic drop (140#/ 30")	54'Rt./"A" Line	8-29-06
Drilling Method:	**North/East:**	**Hole Diameter:**
6.5-inch hollow stem auger		6.5in
Sampling Method:	**Ground Surface Elevation:**	**Total Depth:**
SPT, Bulk	~334.0ft	81.5ft
Notes:	**Depth to GW/date measured:**	**Logged By:**
	No groundwater encountered on 8-29-06	Myo Naing

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (pcf)	Shear Strength (tsf)	Drilling Method/ Casing	Remarks
101.50	0.30	1		SILTY SAND (SM): medium dense, light brown, dry, nonplastic.		1A									COR- Corrosion Test Installed piezometer (40' feet blanks and 40 feet screens)
101.19	0.61	2													
100.89	0.91	3													
100.58	1.22	4													
100.28	1.52	5													
99.97	1.83	6				1	2 4 4	8							Adjustment factor of 1.36 was used for correction of field N-values shown in column "Blows per Foot". (Reference to Memo "Drill Rig Evaluation" dated Dec. 2005.)
99.67	2.13	7		Well-graded SAND (SW): medium dense, light brown, dry, nonplastic.											
99.36	2.44	8													
99.06	2.74	9													
98.76	3.05	10													
98.45	3.35	11				2	5 4 7	11							
98.15	3.66	12		Well-graded SAND (SW): medium dense, light brown, dry, nonplastic, with trace of some fine gravels.											
97.84	3.96	13													
97.54	4.27	14													
97.23	4.57	15													
96.93	4.88	16				3	2 4 6	10			2.9				Mechnical Analysis- MA Test
96.62	5.18	17		Well-graded SAND (SW): medium dense, yellowish brown, dry, nonplastic.											
96.32	5.49	18													
96.01	5.79	19													
95.71	6.10	20													
95.40	6.40	21				4	2 4 4	8							
95.10	6.71	22		Well-graded SAND (SW): medium dense, yellowish brown, dry, nonplastic, micaceous.											
94.79	7.01	23													
94.49	7.32	24													
94.18	7.62	25													
93.88	7.92	26				5	2 6 6	12							
93.57	8.23	27		Well-graded SAND (SW): medium dense, yellowish brown, dry, nonplastic.											
93.27	8.53	28													
92.96	8.84	29													
92.66	9.14	30													

(continued)

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (pcf)	Shear Strength (tsf)	Drilling Method/ Casing	Remarks
92.35	9.45	31		Well-graded SAND (SW): medium dense, yellowish brown, dry, nonplastic. *(continued)*	X	6	4 6 7	13							
92.05	9.75	32		Well-graded SAND with some fine GRAVEL (SW): medium dense, light gray, dry, nonplastic.											
91.74	10.06	33													
91.44	10.36	34													
91.14	10.67	35													
90.83	10.97	36			X	7	2 5 6	11							
90.53	11.28	37													
90.22	11.58	38													
89.92	11.89	39													
89.61	12.19	40		SILTY SAND (SM): medium dense, light gray, dry, nonplastic.											
89.31	12.50	41			X	8	2 4 4	8			5.1				MA Test
89.00	12.80	42		SILTY SAND (SM): medium dense, light gray, dry, nonplastic.											
88.70	13.11	43													
88.39	13.41	44													
88.09	13.72	45													
87.78	14.02	46			X	9	3 6 7	13					P = 0.25		
87.48	14.33	47		Poorly graded SAND (SP): dense, yellowish brown, dry, nonplastic.											
87.17	14.63	48													
86.87	14.94	49													
86.56	15.24	50													
86.26	15.54	51			X	10	4 9 14	23							
85.95	15.85	52		Poorly graded SAND with GRAVEL (SP): medium dense, yellowish brown, dry, nonplastic.											
85.65	16.15	53													
85.34	16.46	54													
85.04	16.76	55													
84.73	17.07	56			X	11	4 8 8	16			5.7				MA Test
84.43	17.37	57		Poorly graded SAND with GRAVEL: same as above.											
84.12	17.68	58													
83.82	17.98	59													
83.52	18.29	60													
83.21	18.59	61			X	12	5 8 9	17							
82.91	18.90	62		SILT (ML): very stiff, yellowish brown, moist, low plasticity.											
82.60	19.20	63		SANDY SILT (ML): stiff, yellowish brown, moist, low plasticity.											
82.30	19.51	64													
81.99	19.81	65													
81.69	20.12	66			X	13	5 4 5	9			28.8				MA Test

(continued)

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (pcf)	Shear Strength (tsf)	Drilling Method/ Casing	Remarks
81.08	20.73	68		SILTY SAND (SM): dense, light gray, moist, nonplastic. *(continued)*											
80.77	21.03	69													
80.47	21.34	70													
80.16	21.64	71			X	14	7 13 12	25							
79.86	21.95	72		SILTY SAND (SM): medium dense, light gray, moist, nonplastic.											
79.55	22.25	73													
79.25	22.56	74													
78.94	22.86	75													
78.64	23.16	76			X	15	4 8 10	18			18.2				MA Test
78.33	23.47	77		SILTY SAND (SM): medium dense, light gray, moist, nonplastic.											
78.03	23.77	78													
77.72	24.08	79													
77.42	24.38	80													
77.11	24.69	81			X	16	3 6 8	14							
76.81	24.99	82		Bottom of Hole at 24.84 m (81.5 ft) on 8-29-06											
76.50	25.30	83													
76.20	25.60	84													
75.90	25.91	85													
75.59	26.21	86													
75.29	26.52	87													
74.98	26.82	88													
74.68	27.13	89													
74.37	27.43	90													
74.07	27.74	91													
73.76	28.04	92													
73.46	28.35	93													
73.15	28.65	94													
72.85	28.96	95													
72.54	29.26	96													
72.24	29.57	97													
71.93	29.87	98													
71.63	30.18	99													
71.32	30.48	100													
71.02	30.78	101													
70.71	31.09	102													
70.41	31.39	103													

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

EA: 06-447700
Date: 11-21-06
Drafted By: Myo Naing

B-06-02

06-FRE-41 / KP 47.48/49.08 (PM 29.5/30.5)

Geotechnical Design Report

Equipment:	Station/KP:	Boring ID.:
CME 750	~1587+35	B-06-03
Hammer:	**Offset Distance/Line:**	**Date Completed:**
Safety automatic drop (140#/ 30")	55'Rt./"A" Line	8-30-06
Drilling Method:	**North/East:**	**Hole Diameter:**
6.5-inch hollow stem auger		6.5in
Sampling Method:	**Ground Surface Elevation:**	**Total Depth:**
SPT, Bulk	~335.0ft	61.5ft
Notes:	**Depth to GW/date measured:**	**Logged By:**
	No groundwater encountered on 8-30-06	Myo Naing

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (pcf)	Shear Strength (tsf)	Drilling Method/ Casing	Remarks
101.80	0.30	1		SILTY SAND (SM): medium dense, light brown, dry, fine sand, nonplastic.											
101.50	0.61	2													
101.19	0.91	3													
100.89	1.22	4													
100.58	1.52	5													
100.28	1.83	6			X	1	3 5 7	12							Adjustment factor of 1.36 was used for correction of field N-values shown in column "Blows per Foot". (Reference to Memo "Drill Rig Evaluation" dated Dec. 2005.)
99.97	2.13	7		Well-graded SAND (SW): loose, light brown, dry, fine to coarse sand, nonplastic.											
99.67	2.44	8													
99.36	2.74	9													
99.06	3.05	10													
98.76	3.35	11			X	2	2 3 5	8							
98.45	3.66	12		Well-graded SAND (SW): loose, yellowish brown, dry, fine to coarse sand, nonplastic.											
98.15	3.96	13													
97.84	4.27	14													
97.54	4.57	15													
97.23	4.88	16			X	3	6 4 4	8							
96.93	5.18	17		Well-graded SAND (SW): loose, yellowish brown, dry, fine to coarse sand, nonplastic.											
96.62	5.49	18													
96.32	5.79	19													
96.01	6.10	20													
95.71	6.40	21			X	4	3 4 4	8							
95.40	6.71	22		Poorly graded SAND (SP): loose, yellowish brown, dry, fine to medium sand, nonplastic.											
95.10	7.01	23													
94.79	7.32	24													
94.49	7.62	25													
94.18	7.92	26			X	5	5 7 7	14							
93.88	8.23	27		Poorly graded SAND (SP): medium dense, yellowish brown, dry, fine to medium sand but excess of fine grained, nonplastic.											
93.57	8.53	28													
93.27	8.84	29													
92.96	9.14	30													

(continued)

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (pcf)	Shear Strength (tsf)	Drilling Method/ Casing	Remarks
92.66	9.45	31			X	6	7 7 6	13							
92.35	9.75	32		Poorly graded SAND (SP): medium dense, light grey, dry, fine to medium sand, nonplastic.											
92.05	10.06	33													
91.74	10.36	34													
91.44	10.67	35													
91.14	10.97	36			X	7	7 12 12	24							
90.83	11.28	37		Poorly graded SAND (SP): medium dense, light grey, dry, fine to medium sand, nonplastic.											
90.53	11.58	38													
90.22	11.89	39													
89.92	12.19	40													
89.61	12.50	41			X	8	4 8 11	19							
89.31	12.80	42		Well-graded SAND (SW): medium dense, light grey, dry, fine to coarse sand, nonplastic.											
89.00	13.11	43													
88.70	13.41	44													
88.39	13.72	45													
88.09	14.02	46			X	9	5 11 8	19							
87.78	14.33	47		Well-graded SAND (SW): medium dense, light grey, dry, fine to coarse sand, nonplastic.											
87.48	14.63	48													
87.17	14.94	49													
86.87	15.24	50													
86.56	15.54	51			X	10	5 8 8	16							
86.26	15.85	52		Well-graded SAND with GRAVEL (SW): medium dense, light grey, dry, fine to coarse sand, nonplastic.											
85.95	16.15	53													
85.65	16.46	54													
85.34	16.76	55													
85.04	17.07	56			X	11	9 10 13	23							
84.73	17.37	57		Well-graded SAND with GRAVEL (SW): medium dense, light grey, moist, fine to coarse sand, nonplastic.											
84.43	17.68	58													
84.12	17.98	59													
83.82	18.29	60													
83.52	18.59	61			X	12	9 12 10	22							
83.21	18.90	62		Bottom of Hole at 18.75 m (61.5 ft) on 8-30-06											
82.91	19.20	63													
82.60	19.51	64													
82.30	19.81	65													
81.99	20.12	66													

Equipment:	Station/KP:	Boring ID.:
CME 750	~1596+86	B-06-04
Hammer:	**Offset Distance/Line:**	**Date Completed:**
Safety automatic drop (140#/ 30")	56'Rt./"A" Line	8-30-06
Drilling Method:	**North/East:**	**Hole Diameter:**
6.5-inch hollow stem auger		6.5in
Sampling Method:	**Ground Surface Elevation:**	**Total Depth:**
SPT, Bulk	~336.0ft	61.5ft
Notes:	**Depth to GW/date measured:**	**Logged By:**
	No groundwater encountered on 8-30-06	Myo Naing

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (pcf)	Shear Strength (tsf)	Drilling Method/ Casing	Remarks
102.11	0.30	1		SANDY SILT (ML): hard, yellowish brown, dry, nonplastic.		1A									Corrosion test sample
101.80	0.61	2													
101.50	0.91	3													
101.19	1.22	4													
100.89	1.52	5													
100.58	1.83	6				1	11 24 15	39							Adjustment factor of 1.36 was used for correction of field N-values shown in column "Blows per Foot". (Reference to Memo "Drill Rig Evaluation" dated Dec. 2005.)
100.28	2.13	7		Well-graded SAND (SW): loose, reddish brown, dry, nonplastic.											
99.97	2.44	8													
99.67	2.74	9													
99.36	3.05	10													
99.06	3.35	11				2	4 5 4	9							
98.76	3.66	12		Well-graded SAND (SW): loose, yellowish brown, dry, nonplastic.											
98.45	3.96	13													
98.15	4.27	14													
97.84	4.57	15													
97.54	4.88	16				3	2 3 3	6							
97.23	5.18	17		Well-graded SAND (SW): medium dense, yellowish brown, dry, nonplastic.											
96.93	5.49	18													
96.62	5.79	19													
96.32	6.10	20													
96.01	6.40	21				4	6 7 9	16							
95.71	6.71	22		Well-graded SAND (SW): medium dense, yellowish brown, dry, nonplastic, clean.											
95.40	7.01	23													
95.10	7.32	24													
94.79	7.62	25													
94.49	7.92	26				5	5 8 10	18							
94.18	8.23	27													
93.88	8.53	28													
93.57	8.84	29													
93.27	9.14	30													

(continued)

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (pcf)	Shear Strength (tsf)	Drilling Method/ Casing	Remarks
92.96	9.45	31				6	5 6 6	12							
92.66	9.75	32		SILT (ML): stiff, yellowish brown, dry, low plasticity.											
92.35	10.06	33		SANDY SILT (ML): very stiff, yellowish brown, dry, low plasticity.											
92.05	10.36	34													
91.74	10.67	35													
91.44	10.97	36				7	5 11 11	22							
91.14	11.28	37		SILT (ML): very stiff, light grey, dry, low plasticity.											
90.83	11.58	38													
90.53	11.89	39													
90.22	12.19	40													
89.92	12.50	41				8	5 15 15	30					P = 1.00		
89.61	12.80	42		Poorly graded SAND (SP): medium dense, yellowish brown, dry, nonplastic.											
89.31	13.11	43													
89.00	13.41	44													
88.70	13.72	45													
88.39	14.02	46				9	4 8 13	21							
88.09	14.33	47													
87.78	14.63	48													
87.48	14.94	49													
87.17	15.24	50													
86.87	15.54	51		SANDY SILT (ML): very stiff, light grey, dry, low plasticity.		10	5 10 15	25							
86.56	15.85	52													
86.26	16.15	53													
85.95	16.46	54													
85.65	16.76	55													
85.34	17.07	56				11	4 8 13	21					P = 1.00		
85.04	17.37	57		SILT (ML): stiff, yellowish brown, moist, low plasticity.											
84.73	17.68	58													
84.43	17.98	59													
84.12	18.29	60													
83.82	18.59	61				12	3 6 9	15					P = 1.25		
83.52	18.90	62		Bottom of Hole at 18.75 m (61.5 ft) on 8-30-06											
83.21	19.20	63													
82.91	19.51	64													
82.60	19.81	65													
82.30	20.12	66													

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

EA:	06-447700
Date:	11-21-06
Drafted By:	Myo Naing

B-06-04

06-FRE-41 / KP 47.48/49.08 (PM 29.5/30.5)

Geotechnical Design Report

Equipment:	Station/KP:	Boring ID.:
CME 750	~1603+42	B-06-05
Hammer:	**Offset Distance/Line:**	**Date Completed:**
Safety automatic drop (140#/ 30")	36'Rt./"A" Line	8-31-06
Drilling Method:	**North/East:**	**Hole Diameter:**
6.5-inch hollow stem auger		6.5in
Sampling Method:	**Ground Surface Elevation:**	**Total Depth:**
SPT, Bulk	~335.0ft	61.5ft
Notes:	**Depth to GW/date measured:**	**Logged By:**
	No groundwater encountered on 8-31-06	Myo Naing

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (pcf)	Shear Strength (tsf)	Drilling Method/ Casing	Remarks
101.80	0.30	1		SANDY SILT (ML): very stiff, light brown, dry, low plasticity.											
101.50	0.61	2													
101.19	0.91	3													
100.89	1.22	4													
100.58	1.52	5													
100.28	1.83	6			X	1	8 10 10	20							Adjustment factor of 1.36 was used for correction of field N-values shown in column "Blows per Foot". (Reference to Memo "Drill Rig Evaluation" dated Dec. 2005.)
99.97	2.13	7		Well-graded SAND (SW): loose, reddish brown, dry, fine to coarse sand, nonplastic.											
99.67	2.44	8													
99.36	2.74	9													
99.06	3.05	10													
98.76	3.35	11			X	2	2 4 4	8							
98.45	3.66	12		Well-graded SAND (SW): loose, yellowish brown, dry, fine to coarse sand, nonplastic.											
98.15	3.96	13													
97.84	4.27	14													
97.54	4.57	15													
97.23	4.88	16			X	3	1 3 3	6							
96.93	5.18	17		Poorly graded SAND (SP): medium dense, yellowish brown, dry, fine to medium sand, nonplastic.											
96.62	5.49	18													
96.32	5.79	19													
96.01	6.10	20													
95.71	6.40	21			X	4	2 5 6	11							
95.40	6.71	22		Poorly graded SAND (SP): medium dense, light grey, dry, fine to medium sand, nonplastic.											
95.10	7.01	23													
94.79	7.32	24													
94.49	7.62	25													
94.18	7.92	26			X	5	4 9 12	21							
93.88	8.23	27													
93.57	8.53	28													
93.27	8.84	29													
92.96	9.14	30													

(continued)

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (pcf)	Shear Strength (tsf)	Drilling Method/ Casing	Remarks
92.66	9.45	31		SILT (ML): very stiff, yellowish brown, dry, low plasticity.		6	3 5 12	17					P = 1.25		
92.35	9.75	32		SANDY SILT (ML): very stiff, yellowish brown, dry, low plasticity.											
92.05	10.06	33													
91.74	10.36	34													
91.44	10.67	35													
91.14	10.97	36				7	5 9 10	19							
90.83	11.28	37		SILT (ML): very stiff, light grey, dry, low plasticity.											
90.53	11.58	38													
90.22	11.89	39													
89.92	12.19	40													
89.61	12.50	41				8	3 9 11	20					P = 1.00		
89.31	12.80	42		Poorly graded SAND (SP): medium dense, yellowish brown, dry, fine to medium sand, nonplastic.											
89.00	13.11	43													
88.70	13.41	44													
88.39	13.72	45													
88.09	14.02	46				9	2 6 6	12							
87.78	14.33	47		SILT (ML): hard, light grey, dry, low plasticity.											
87.48	14.63	48													
87.17	14.94	49													
86.87	15.24	50													
86.56	15.54	51				10	4 13 20	33					P = 2.50		
86.26	15.85	52		Poorly graded SAND (SP): medium dense, light grey, dry, fine sand, nonplastic.											
85.95	16.15	53													
85.65	16.46	54													
85.34	16.76	55													
85.04	17.07	56				11	5 13 15	28							
84.73	17.37	57													
84.43	17.68	58													
84.12	17.98	59													
83.82	18.29	60													
83.52	18.59	61		SANDY SILT (ML): medium dense, low plasticity. Poorly graded SAND (SP): medium dense, light grey, dry, fine sand, nonplastic.		12	12 12 17	29							
83.21	18.90	62		Bottom of Hole at 18.75 m (61.5 ft) on 8-31-06											
82.91	19.20	63													
82.60	19.51	64													
82.30	19.81	65													
81.99	20.12	66													

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

EA:	06-447700
Date:	11-21-06
Drafted By:	Myo Naing

B-06-05

06-FRE-41 / KP 47.48/49.08 (PM 29.5/30.5)

Geotechnical Design Report

State of California
Department of Transportation

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: JACK R. WALKER
Senior Design Engineer
Office of Design II

Attention: Jose Bautista

Date: April 20, 2007

File: 06-FRE-41-PM R29.5/R30.5
EA: 06-447700
Herndon Auxiliary Lane

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES – MS 5

Subject: Geotechnical Design Report for Sound Wall and Sound Wall on Retaining Wall

Introduction

Per your request, we are providing a Geotechnical Design Report (GDR) for the sound wall and sound wall on retaining wall along the Herndon off-ramp of SR 41 between the south end of the existing Foxwood Apartment's wall and Herndon Avenue in the city of Fresno, California. This structure is to be constructed as part of the Herndon Auxiliary Lane project on State Route 41 from the Bullard Avenue on-ramp to the Herndon Avenue off-ramp and to widen the off-ramp with an additional lane. In general, this memorandum summarizes and presents our specific recommendations for a proposed sound wall only. A Location Map is presented as Plate 1.

Pertinent Reports and Investigations

The following documents, reports and maps were reviewed to assist in the assessment of site conditions:

- *California Seismic Hazard Map 1996*, Caltrans, dated 1966, by Lalliana Mualchin.
- *Geologic Map of California, Fresno Sheet*, compilation by Robert A. Matthews and John L. Burnett, dated 1965, published by CDMG.
- Memorandum of Foundation Investigation dated September 16 1986 and As Built LOTB dated February 2 1987 prepared by the Geotechnical Branch- Transportation Laboratory for Herndon Avenue UC (Br. No. 42-0305R/L)
- Bridge Inspection Report dated March 29, 2006 for the Herndon Avenue UC Bridge No. 42-0305L by the Office of the Structure Maintenance and Investigation.
- Memorandum of Geotechnical Design Report dated December 8, 2006 for the Herndon Auxiliary Lane prepared by the Office of Geotechnical Design North.

- Project Layout L-4, Typical Cross Sections X-4 and X-5 dated February 14, 2007 for the Herndon Auxiliary Lane prepared by the District.

Existing Facilities and Proposed Improvements

The NB Herndon Avenue off ramp begins as a one-lane ramp with a two foot left shoulder and an eight-foot right shoulder. Then, transitions to a two-lane ramp with a two-foot left shoulder and a two-foot right shoulder. It is concluding as three-lane ramp with a two-foot left shoulder and a two-foot right shoulder at the intersection with Herndon Avenue. Currently, there is one left turn lane, one right turn lane, and the middle lane dedicated to both a right and left turn. There is a traffic operational problem during evening peak hours on NB SR 41 at the Herndon Avenue off ramp.

In order to improve the traffic operation of NB SR 41 between Bullard Avenue and Herndon Avenue, this project proposes to construct a NB auxiliary lane on SR 41 from the Bullard Avenue on-ramp to the Herndon Avenue off-ramp and to widen the off-ramp with an addition lane. According to a Noise Study Report of the Caltrans Environmental Engineering Division, the District requires to construct a sound wall along the Herndon Avenue off-ramp. Based on the layout plan L4, typical cross sections X-4 and X-5, details of the proposed sound wall is summarized in Table 1 below.

Table 1- Proposed Sound Wall

Wall Section	Beginning Station/ Offset	Ending Station/ Offset	Length (ft)	Height (ft)	Type
Section 1	Sta. 5+30.00 "D" Line 74.95′ Rt.	Sta. 13+75.00 "D" Line 48.84′ Rt.	±845.00	9.25	SW Masonry Block
Section 2	Sta. 13+75.00 "D" Line 48.84′ Rt.	Sta. 18+00.00 "D" Line 50.01′ Rt.	±425.00	3.25	SW on RW Type 5SWBP

Regional Geology

This project is located on the southern part of the Great Valley geomorphic province of California. The Geologic Map of California, Fresno Sheet (1966), indicates that the soil present in the entire area is Quaternary age sediments consisting of fan deposits (Qf), and

nonmarine sedimentary deposits (Qc). Pleistocene nonmarine sedimentary deposits (Qc) consisting of granitic sand, silt, and clay underlie the majority of the project site. The "Qc" unit normally underlies the "Qf" unit. The eastern areas beyond the project limits are founded on Mesozoic granitic rocks, Mesozoic ultrabasic intrusive rocks, and Pre-Cretaceous metasedimentary rocks and/or metavolcanic rocks. (See Plate 2)

Seismicity

Based upon the Department's California Seismic Hazard Map, dated 1996, the controlling fault is the Coast Ranges-Sierran Block Boundary Zone (CSB, Reverse including thrust) with a maximum credible earthquake moment magnitude of M_w= 7. The CSB is located about 50 miles southwest of the site. The Peak Horizontal Bedrock Acceleration is estimated to be 0.2g. The potential for surface rupture at the site due to fault movement is considered insignificant since there are no known faults projecting towards or passing directly through the project site. (See Plate 3)

Groundwater

Groundwater was not encountered within the maximum-drilled depth of 82 feet during the previous field investigations completed in June 1986 and August 2006. Based on the DWR historical well data within the period of 1971 and 2005, the average groundwater elevation within the project site is approximately 210 feet which would correspond to approximately 100 feet below the ground surface.

Subsurface Conditions

Based on the subsurface investigations performed in June 1986 and August 2006, loose dry sand is encountered at the depth ranging 7 to 15 feet below existing ground elevation. The soil below loose sand present at the site is composed of interbedded layers of medium dense to very dense sand, medium dense to dense silty sand, and stiff to hard silt. Bedrock was not encountered within the maximum depth drilled during these investigations. As-Built LOTB dated February 1987, and boring logs of B-06-04 and B-06-05 dated August 2006 are presented in Appendix.

Geotechnical Recommendations

The geotechnical recommendations for a sound wall along the Herndon Avenue off-ramp discussed in this section are referenced to the layout, typical cross sections, regional geologic map, as built LOTB of Br. No. 42-0305L, and boring logs of B-06-04 and B-06-05.

Sound Wall Section 1 (Sta. 5+30.00 to Sta. 13+75.00)

Sound Wall Section 1 may be founded on a trench footing as shown on 2006 Standard Plan B 15-1, using the condition of Case 1 for level ground on both sides of the wall. We recommend that the trench depth be adopted from the column of ϕ= 25 for Case 1 in 2006 Standard Plan B15-1. Table 2 summarizes the recommendations given above.

Table 2- The Design Data for Sound Wall Section 1

Structure	Location	Foundation Type	Ground Line Condition	ϕ
SW	Sta. 5+30.00 to Sta.13+75.00	Trench Footing	Case 1	25°

Sound Wall Section 2 (Sta. 13+75.00 to Sta. 18+00.00)

This Sound Wall Section will be supported on Retaining Wall. Foundation types that were evaluated, but not recommended, include spread footings, and cast-in-drilled-hole (CIDH) piles. Spread footing foundations are not recommended due to settlement concerns at top 15 feet below original ground. CIDH construction would be difficult given the loose granular materials present.

Sound Wall on Retaining Wall may be founded on Class 90 concrete piles as per the Bridge Standard Detail sheet of Retaining Wall Type 5SWBP- files xs14-370-1 and xs14-370-2 dated 2/25/2003. The Pile Capacity should be used to determine pile acceptance with the Gates formula in accordance with 2006 Standard Specification Section 49-1.08. Table 3 summarizes the recommendations for the concrete piles.

Table 3- The Design Data for Sound Wall Section 2

Structure	Location	Foundation Type	Design Loading	Min. Pile Length required below Pile Footing
SW on RW	Sta. 13+75.00 to Sta. 18+00.00	Class 90 Concrete piles	90 kip (45 T)	32 feet

Note: Pile details for Class 90 can be found in 2006 Standard Plan B2-5

Construction Considerations

It is anticipated that groundwater will not be encountered during the construction. This assessment is based on data from the as-built LOTB and boring logs as attached.

The sound wall on retaining wall will be constructed above original ground. The District assures that the footings shall be embedded at a sufficient depth and the backfill placed behind the retaining wall should meet the structure backfill requirements set forth in the standard specifications and standard plans. Backfill and compaction of depressions and pits created from clearing and grubbing at the base of the footings shall also conform to the requirements of the standard specifications.

Project Information

Standard Special Provision S5-280, "Project Information", discloses to bidders and contractors a list of pertinent information available for their inspection prior to bid opening. The following is an excerpt from SSP S5-280 disclosing information originating from Geotechnical Services. Items listed to be included in the Information Handout will be provided in Acrobat (.pdf) format to the addressee(s) of this report via electronic mail.

Data and information attached with the project plans are:

1. *As built Log of Test Borings for Herndon Avenue UC (Br. No. 42-0305R/L)*

Data and Information included in the Information Handout provided to the bidders and Contractors are:

A. Geotechnical Design Report for Sound Wall for the Herndon Auxiliary Lane, Dated 04/20/2007
B. Geotechnical Design Report for the Herndon Auxiliary Lane, Dated 12/08/2006

Data and Information available for inspection at the District Office:
A. None
Data and Information available for inspection at the Transportation Laboratory are:
A. None

The recommendations contained in this memorandum are based on specific project information. If any conceptual changes to the structure are proposed during final project design, the Office of Geotechnical Design North should review those changes to determine if the foundation recommendations contained herein are still applicable.

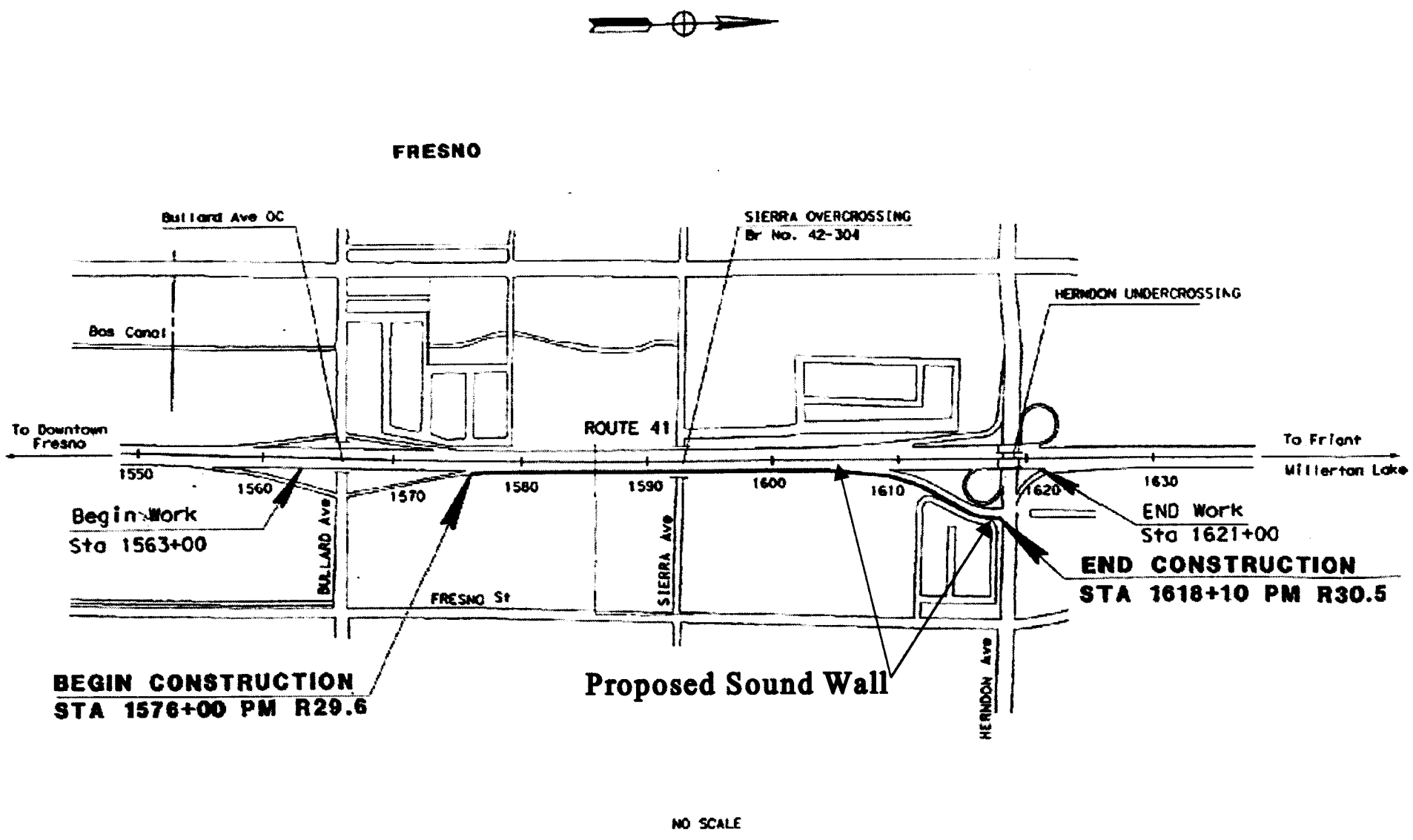
If you have any questions or comments, please contact Myo Naing at (916) 227-7233 or John Huang at (916) 227-7237.

MYO NAING
Engineering Geologist
Office of Geotechnical Design – North
Branch E

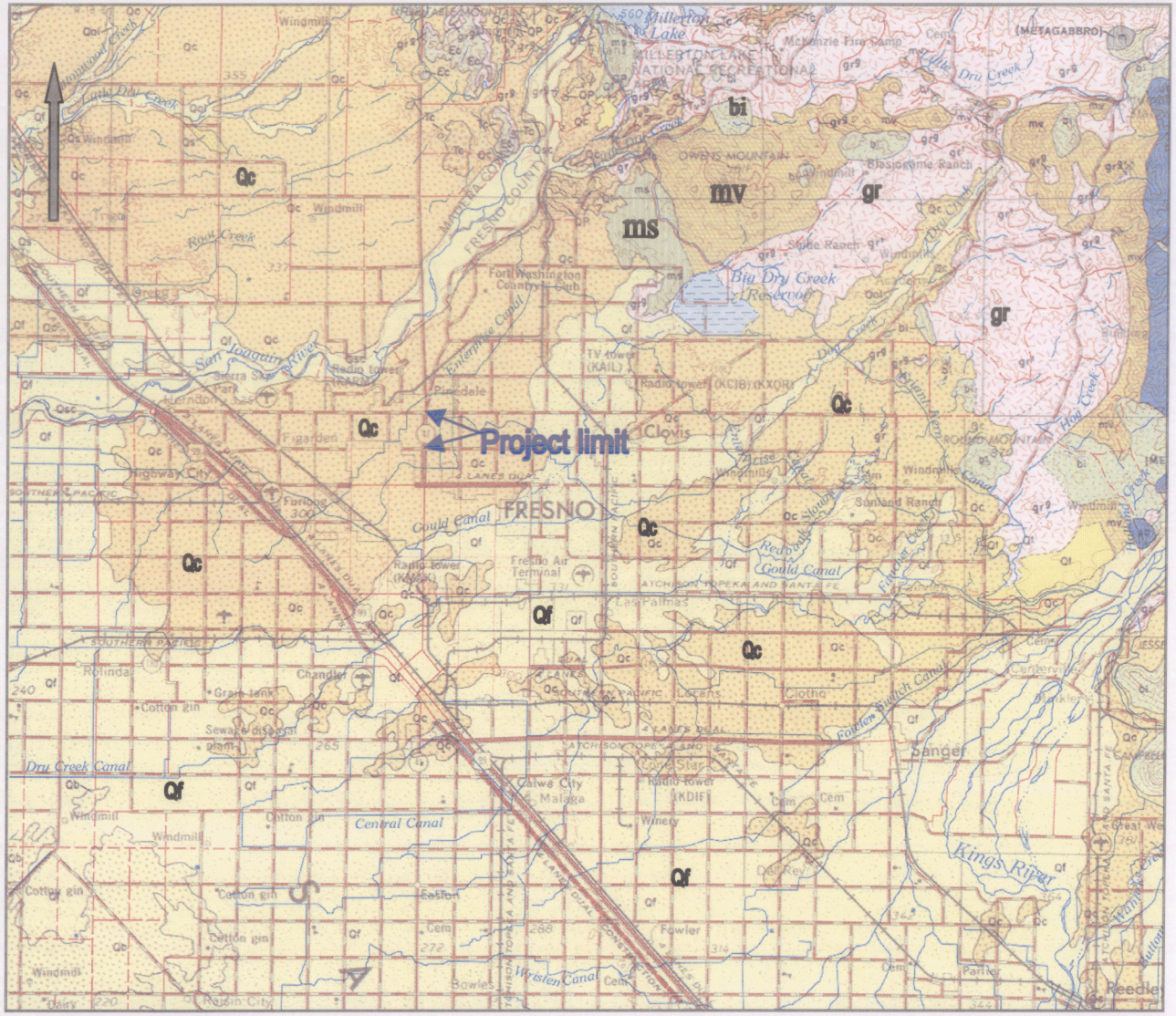
JOHN (QIANG) HUANG, PE
Senior Material & Research Engineer
Office of Geotechnical Design – North
Branch E

Attachments

c: RonSekhon (E-copy)
GDN File



CALTRANS Division of Engineering Services Geotechnical Services Office of Geotechnical Design -North	EA: 06-447700 April 2007	**LOCATION MAP** HERNDON AUXILIARY LANE
	06-FRE-41-PM R29.5/R30.5 **GEOTECHNICAL DESIGN REPORT**	Plate 1

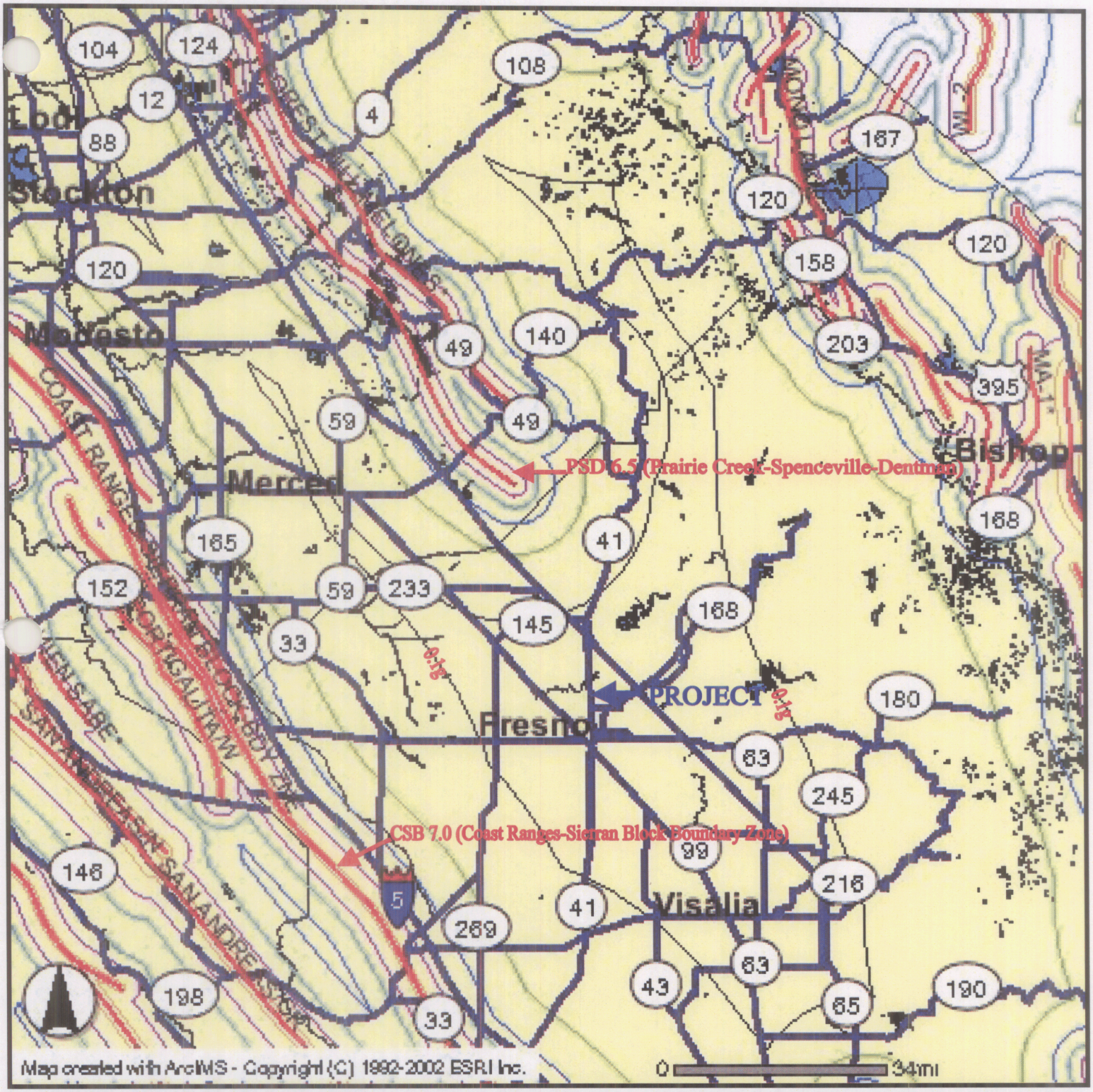


EXPLANATION

Qf	Fan deposits
Qc	Pleistocene nonmarine sedimentary deposits
gr	Mesozoic granitic rocks
bi	Mesozoic basic intrusive rocks
mv	Pre-cretaceous metavolcanic rocks
ms	Pre-cretaceous metasedimentary rocks

Scale: 1:250,000

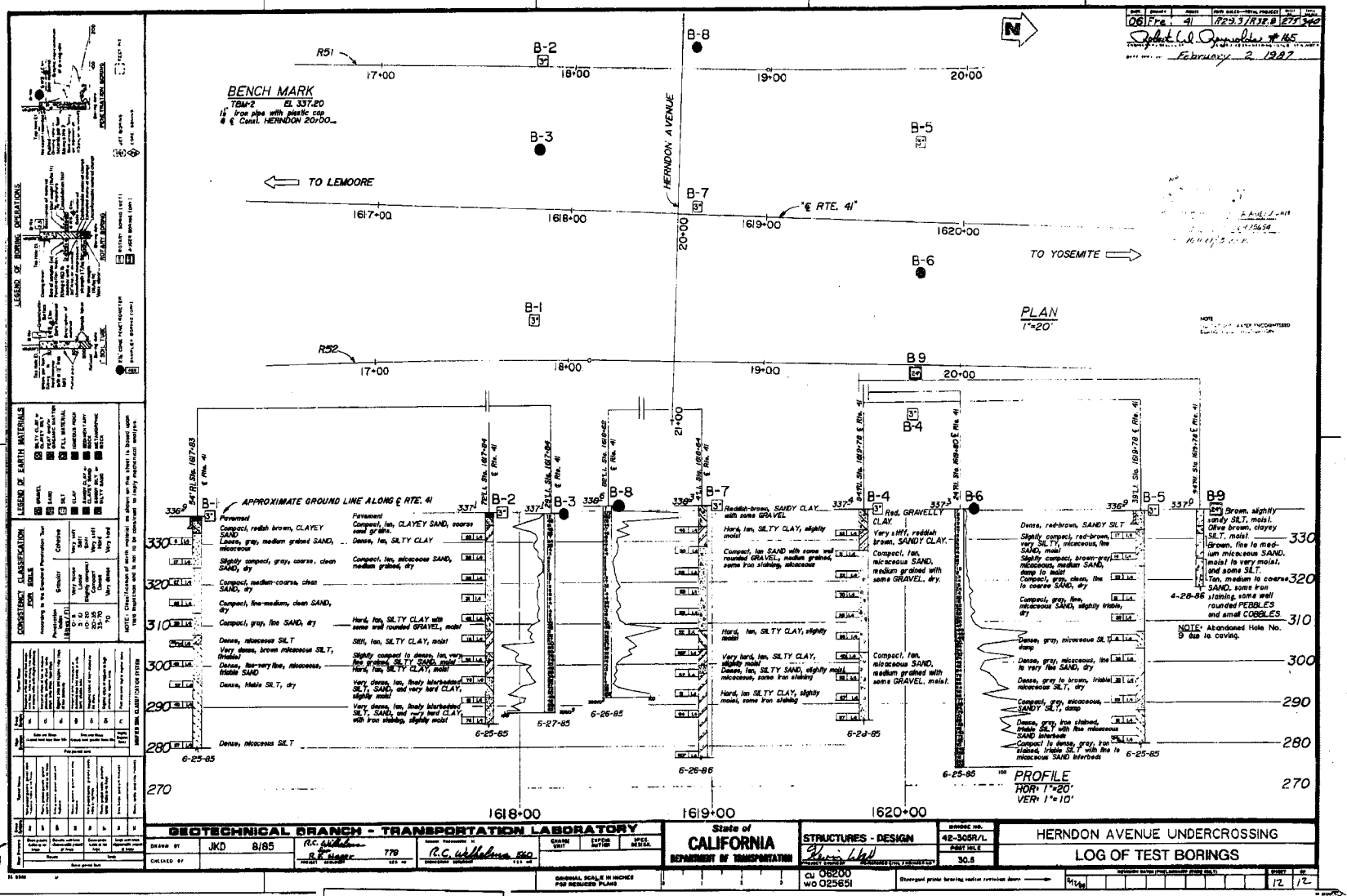
CALTRANS Division of Engineering Services Geotechnical Services Office of Geotechnical Design North	EA: 06-447700 April 2007	**REGIONALGEOLOGIC MAP HERNDON AUXILIARY LANE**
	06-FRE-41-PM R29.5/R30.5 GEOTECHNICAL DESIGN REPORT	Plate 2



CALTRANS Division of Engineering Services Geotechnical Services Office of Geotechnical Design North	EA: 06-447700 April 2007	SEISMIC HAZARD MAP HERNDON AUXILIARY LANE
	06-FRE-41-PM R29.5/R30.5 GEOTECHNICAL DESIGN REPORT	Plate 3

APPENDIX

- As-built LOTB for Herndon Avenue (Br. No. 42-0305R/L)
- 2006 Boring Location
- 2006 Boring Logs for B-06-04 and B-06-05



06	Fre. 41	R29.3/R32.8	279	340			

Caltrans Cal. Spreadsheet #165

February 2 1987

GEOTECHNICAL BRANCH - TRANSPORTATION LABORATORY

DRAWN BY	JKD 8/85	R.C. Wilhelm for R.E. Hogan 778	R.C. Wilhelm 560
CHECKED BY			

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES - DESIGN

BRIDGE NO.	42-305R/L
POST MILE	30.5

cu 06200
wo 025651

HERNDON AVENUE UNDERCROSSING

LOG OF TEST BORINGS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS

SHEET	OF
12	12

275

AS BUILT PLANS
Contract No. 06-025654
Date Completed 11-27-89
Document No. ____

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.

9-21-90 Ronald Blackford

CALTRANS Division of Engineering Services Geotechnical Services Office of Geotechnical Design -North	EA: 06-447700 April 2006	**BORING LOCATION MAP** HERNDON AUXILIARY LANE
	06-FRE-41-PM R29.5/R30.5 **GEOTECHNICAL DESIGN REPORT**	Appendix

GRAPHIC SYMBOLS


Bulk Sample


Rock Core


Modified California Sampler


Standard Penetration Sampler


Shelby Tube


Vane Shear


Auger


Diamond Core


Rotary


California Sampler


Water Level - 1st Reading

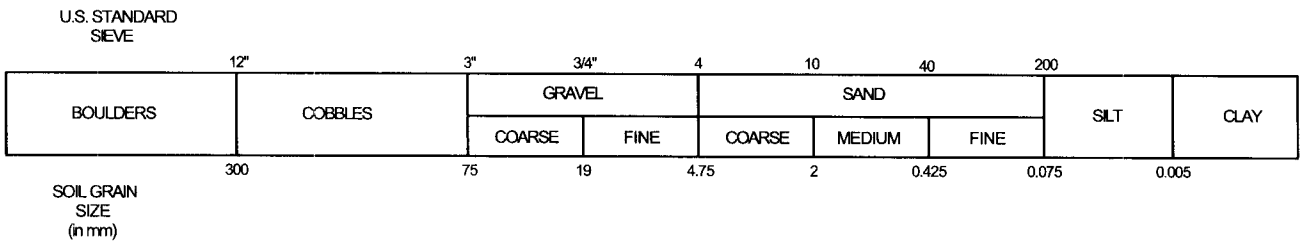

Water Level - 2nd Reading


Water Level - 3rd Reading

TESTING

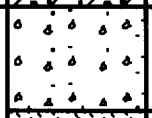
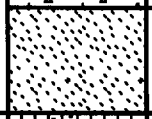
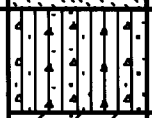
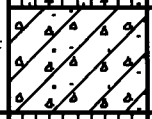
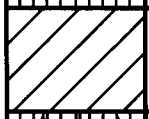
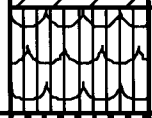
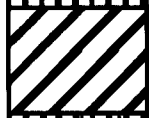
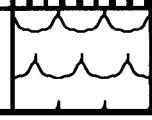
CONS	Consolidation (Cal Test 219)	RQD	Rock Quality Designation (ASTM D6032)
UU	Unconsolidated Undrained Triaxial (Cal Test 230)	CP	Compaction Test (Cal Test 216)
CU	Consolidated Undrained Triaxial (Cal Test 230)	PERM	Permeability (Cal Test 220)
DS	Direct Shear (ASTM D3080)	COR	Corrosivity Testing (Cal Test 532/643)
UC	Unconfined Compression (Cal Test 221)	GRAD	Gradation Analysis (Cal Tests 202/203)
LL	Liquid Limit-% (Cal Test 204)	EP	Expansion Pressure (Cal Test 354)
PI	Plasticity Index-% (Cal Test 204)	OC	Organic Content-% (ASTM D2974)
PP	Pocket Penetrometer	SE	Sand Equivalent (Cal Test 217)
TV	Pocket Torvane		

SOIL GRAIN SIZE



GENERAL NOTES

1. Logs represent general subsurface conditions observed at the point of exploration on the date indicated.
2. In general, USCS designations presented on logs were established by visual methods only; therefore, actual designations (based on laboratory tests) may vary.
3. No warranty is provided as to the continuity of soil conditions between individual sample locations.
4. Lines separating strata on the logs represent approximate boundaries only; actual transitions may be different or gradual.
5. Pocket penetrometer values reported on the logs under shear strength are actual values as recorded in the field. (To be used in analysis, the pocket penetrometer value should be divided by two)

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

EA: 06-447700
Date: 11-21-06

SOIL CLASSIFICATION SYSTEM

Equipment:	Station/KP:	Boring ID.:
CME 750	~1596+86	B-06-04
Hammer:	**Offset Distance/Line:**	**Date Completed:**
Safety automatic drop (140#/ 30")	56'Rt./"A" Line	8-30-06
Drilling Method:	**North/East:**	**Hole Diameter:**
6.5-inch hollow stem auger		6.5in
Sampling Method:	**Ground Surface Elevation:**	**Total Depth:**
SPT, Bulk	~336.0ft	61.5ft
Notes:	**Depth to GW/date measured:**	**Logged By:**
	No groundwater encountered on 8-30-06	Myo Naing

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (pcf)	Shear Strength (tsf)	Drilling Method/ Casing	Remarks
102.11	0.30	1		SANDY SILT (ML): hard, yellowish brown, dry, nonplastic.		1A									Corrosion test sample
101.80	0.61	2													
101.50	0.91	3													
101.19	1.22	4													
100.89	1.52	5													
100.58	1.83	6				1	11 24 15	39							Adjustment factor of 1.36 was used for correction of field N-values shown in column "Blows per Foot". (Reference to Memo "Drill Rig Evaluation" dated Dec. 2005.)
100.28	2.13	7		Well-graded SAND (SW): loose, reddish brown, dry, nonplastic.											
99.97	2.44	8													
99.67	2.74	9													
99.36	3.05	10													
99.06	3.35	11				2	4 5 4	9							
98.76	3.66	12		Well-graded SAND (SW): loose, yellowish brown, dry, nonplastic.											
98.45	3.96	13													
98.15	4.27	14													
97.84	4.57	15													
97.54	4.88	16				3	2 3 3	6							
97.23	5.18	17		Well-graded SAND (SW): medium dense, yellowish brown, dry, nonplastic.											
96.93	5.49	18													
96.62	5.79	19													
96.32	6.10	20													
96.01	6.40	21				4	6 7 9	16							
95.71	6.71	22		Well-graded SAND (SW): medium dense, yellowish brown, dry, nonplastic, clean.											
95.40	7.01	23													
95.10	7.32	24													
94.79	7.62	25													
94.49	7.92	26				5	5 8 10	18							
94.18	8.23	27													
93.88	8.53	28													
93.57	8.84	29													
93.27	9.14	30													

(continued)

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (pcf)	Shear Strength (tsf)	Drilling Method/ Casing	Remarks
92.96	9.45	31				6	5 6 6	12							
92.66	9.75	32		SILT (ML): stiff, yellowish brown, dry, low plasticity. SANDY SILT (ML): very stiff, yellowish brown, dry, low plasticity.											
92.35	10.06	33													
92.05	10.36	34													
91.74	10.67	35													
91.44	10.97	36				7	5 11 11	22							
91.14	11.28	37		SILT (ML): very stiff, light grey, dry, low plasticity.											
90.83	11.58	38													
90.53	11.89	39													
90.22	12.19	40													
89.92	12.50	41				8	5 15 15	30					P = 1.00		
89.61	12.80	42		Poorly graded SAND (SP): medium dense, yellowish brown, dry, nonplastic.											
89.31	13.11	43													
89.00	13.41	44													
88.70	13.72	45													
88.39	14.02	46				9	4 8 13	21							
88.09	14.33	47													
87.78	14.63	48													
87.48	14.94	49													
87.17	15.24	50													
86.87	15.54	51		SANDY SILT (ML): very stiff, light grey, dry, low plasticity.		10	5 10 15	25							
86.56	15.85	52													
86.26	16.15	53													
85.95	16.46	54													
85.65	16.76	55													
85.34	17.07	56				11	4 8 13	21					P = 1.00		
85.04	17.37	57		SILT (ML): stiff, yellowish brown, moist, low plasticity.											
84.73	17.68	58													
84.43	17.98	59													
84.12	18.29	60													
83.82	18.59	61				12	3 6 9	15					P = 1.25		
83.52	18.90	62		Bottom of Hole at 18.75 m (61.5 ft) on 8-30-06											
83.21	19.20	63													
82.91	19.51	64													
82.60	19.81	65													
82.30	20.12	66													

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

EA:	06-447700
Date:	11-21-06
Drafted By:	Myo Naing

B-06-04

06-FRE-41 / KP 47.48/49.08 (PM 29.5/30.5)

Geotechnical Design Report

Equipment:	Station/KP:	Boring ID.:
CME 750	~1603+42	B-06-05
Hammer:	**Offset Distance/Line:**	**Date Completed:**
Safety automatic drop (140#/ 30")	36'Rt./"A" Line	8-31-06
Drilling Method:	**North/East:**	**Hole Diameter:**
6.5-inch hollow stem auger		6.5in
Sampling Method:	**Ground Surface Elevation:**	**Total Depth:**
SPT, Bulk	~335.0ft	61.5ft
Notes:	**Depth to GW/date measured:**	**Logged By:**
	No groundwater encountered on 8-31-06	Myo Naing

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (pcf)	Shear Strength (tsf)	Drilling Method/ Casing	Remarks
101.80	0.30	1		SANDY SILT (ML): very stiff, light brown, dry, low plasticity.											
101.50	0.61	2													
101.19	0.91	3													
100.89	1.22	4													
100.58	1.52	5													
100.28	1.83	6			X	1	8 10 10	20							Adjustment factor of 1.36 was used for correction of field N-values shown in column "Blows per Foot". (Reference to Memo "Drill Rig Evaluation" dated Dec. 2005.)
99.97	2.13	7		Well-graded SAND (SW): loose, reddish brown, dry, fine to coarse sand, nonplastic.											
99.67	2.44	8													
99.36	2.74	9													
99.06	3.05	10													
98.76	3.35	11			X	2	2 4 4	8							
98.45	3.66	12		Well-graded SAND (SW): loose, yellowish brown, dry, fine to coarse sand, nonplastic.											
98.15	3.96	13													
97.84	4.27	14													
97.54	4.57	15													
97.23	4.88	16			X	3	1 3 3	6							
96.93	5.18	17		Poorly graded SAND (SP): medium dense, yellowish brown, dry, fine to medium sand, nonplastic.											
96.62	5.49	18													
96.32	5.79	19													
96.01	6.10	20													
95.71	6.40	21			X	4	2 5 6	11							
95.40	6.71	22		Poorly graded SAND (SP): medium dense, light grey, dry, fine to medium sand, nonplastic.											
95.10	7.01	23													
94.79	7.32	24													
94.49	7.62	25													
94.18	7.92	26			X	5	4 9 12	21							
93.88	8.23	27													
93.57	8.53	28													
93.27	8.84	29													
92.96	9.14	30													

(continued)

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (pcf)	Shear Strength (tsf)	Drilling Method/ Casing	Remarks
92.66	9.45	31		SILT (ML): very stiff, yellowish brown, dry, low plasticity.		6	3 5 12	17					P = 1.25		
92.35	9.75	32		SANDY SILT (ML): very stiff, yellowish brown, dry, low plasticity.											
92.05	10.06	33													
91.74	10.36	34													
91.44	10.67	35													
91.14	10.97	36				7	5 9 10	19							
90.83	11.28	37		SILT (ML): very stiff, light grey, dry, low plasticity.											
90.53	11.58	38													
90.22	11.89	39													
89.92	12.19	40													
89.61	12.50	41				8	3 9 11	20					P = 1.00		
89.31	12.80	42		Poorly graded SAND (SP): medium dense, yellowish brown, dry, fine to medium sand, nonplastic.											
89.00	13.11	43													
88.70	13.41	44													
88.39	13.72	45													
88.09	14.02	46				9	2 6 6	12							
87.78	14.33	47		SILT (ML): hard, light grey, dry, low plasticity.											
87.48	14.63	48													
87.17	14.94	49													
86.87	15.24	50													
86.56	15.54	51				10	4 13 20	33					P = 2.50		
86.26	15.85	52		Poorly graded SAND (SP): medium dense, light grey, dry, fine sand, nonplastic.											
85.95	16.15	53													
85.65	16.46	54													
85.34	16.76	55													
85.04	17.07	56				11	5 13 15	28							
84.73	17.37	57													
84.43	17.68	58													
84.12	17.98	59													
83.82	18.29	60													
83.52	18.59	61		SANDY SILT (ML): medium dense, low plasticity Poorly graded SAND (SP): medium dense, light grey, dry, fine sand, nonplastic.		12	12 12 17	29							
83.21	18.90	62		Bottom of Hole at 18.75 m (61.5 ft) on 8-31-06											
82.91	19.20	63													
82.60	19.51	64													
82.30	19.81	65													
81.99	20.12	66													

State of California
DEPARTMENT OF TRANSPORTATION

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MR. ART RAMIREZ
Senior Design Engineer
Office of Design II Branch R

Date: November 14, 2007

Attention: Mr. Jason Castillo

File: 06-Fre-41-PM R29.5/R30.5
EA: 06-447701
Herndon Auxiliary Lane

From: JOHN BOWMAN
Senior Engineering Geologist
Geotechnical Services
Division of Engineering Services

Subject: Geotechnical Recommendations.

This report is in response to the September 17, 2007 request for additional geotechnical recommendations for the Herndon Auxiliary Lane project. The following recommendations supersede, as specified below, those given in the "Geotechnical Design Report for Sound Wall and Sound Wall on Retaining Wall" dated April 20, 2007, and the "Geotechnical Design Report" dated December 6, 2006.

Alternative Retaining Wall System

The type 5 wall was reviewed due to the close presence of a groundwater recharge basin for much of the length of the proposed retaining wall and due to the concern of the resulting bearing pressure at or close to the maximum allowable bearing pressure. As a result of the basin and its proximity, use of the type 5 wall in this area is not recommended.

A type 1A retaining wall was reviewed as an alternative retaining wall system and determined to be a suitable alternative. This wall has the following advantages over the type 5 wall:

1) Utilizes a reduced footing width of 4'-2" behind the wall vs 8"-0" for a 10' high type 5 wall; this translates to less shoring height required and less structure excavation, backfill and stockpiling of soil.
2) Results in reduced footing pressure with up to 3.0 ksf allowable bearing pressure on native soils (vs. the type 5 bearing pressure of 4.1 ksf with an allowable of 4.2 ksf).
3) Only surficial compaction (compaction to 95% of the upper 1' of soil) is required (no over excavation of 2' and structure backfill as required in utilizing the type 5 wall).

A type 1 retaining wall is also a viable alternative retaining wall if heights exceeding 12' are needed. Type 1 walls up to 14' high may be supported on spread footings on surficially compacted soils. Walls up to 18 feet high may be supported on spread footings provided the underlying soil is overexcavated by two feet and replaced with granular material compacted to 95% relative compaction.

A soldier pile wall is an acceptable alternative, however this would require Structure Design to design the wall. A typical soldier pile wall might require steel soldier piles placed in 24"-36" diameter CIDH piles at least 15 feet deep spaced about 8 feet apart. Tiebacks may or may not be needed depending on wall height. Should this alternative be selected, we will provide additional information as needed.

Soil nail walls are not considered to be feasible due to the cohesionless sandy soils.

CIDH Pile Design for Modified CMS Mast on Pedestal

The proposed CMS sign on pedestal may be supported on a standard CMS CIDH pile foundation (5' diameter) with additional length of 3 feet to support the additional loads imparted by the pedestal. The adjusted minimum length of CIDH pile for the CMS sign on pedestal is 25 feet.

Footing-Pipe Culvert Conflict

The proposed retaining wall will cross a pressurized culvert. It is assumed that the culvert is not designed to support the additional load of a retaining wall. 90 kip 16"diameter CIDH piles are recommended to support the wall and bridge the culvert. Bridging as shown on drawing RW-4 (total length of bridge is 26.7') should be sufficient to mitigate any potential undermining of spread footings due to water infiltration. Recommended pile length is 35 feet. Piles must be vertical. Design by Structure Design may be necessary.

Wing Wall at End of Retaining Wall

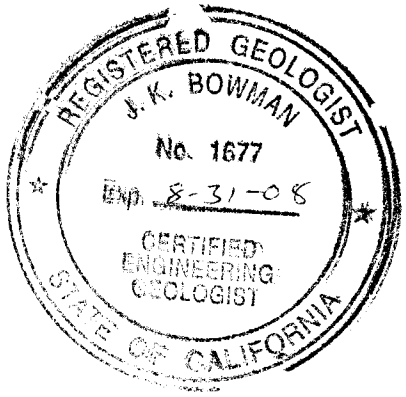
Retaining walls may be terminated with a wing wall. Spread footings with an allowable load of up to 3.0 ksf (ultimate load of 9.0 ksf) are recommended. Walls may also be supported by CIDH piles. 90 kip 16" diameter CIDH piles would be 35 feet long.

Trench Footing for Sound Wall.

The proposed sound wall may be supported by spread footings instead of the previously recommended trench footing. A standard spread footing design (Sound Wall Masonry Block on Footing sheet B15-1) requires an allowable bearing capacity of 1.5 ksf. The allowable bearing capacity for the sound wall is 2.0 ksf assuming the soil beneath the footing is surficially compacted. Removal and replacement of soil is not required.

If you have any questions or need additional information, please call John Bowman at 916-709-3170.

c: RBibbens, QHuang, repending file, GDNFile, GSFileRoom



State of California
Department of Transportation

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MR. SCOTT SHAVER
Office of Design
District 6

Attention: Jason Castillo
Project Engineer

Date: January 21, 2010
File: 06-FRE-41
PM R29.5/R30.5
EA: 06-447701
06-0E9701

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES – MS 5

Subject: Supplemental Recommendations to Geotechnical Design Report

Introduction

Per your request, we are providing supplemental recommendations to the Geotechnical Design Report (GDR) dated December 8, 2006 for proposed improvements to State Route 41 between PM R29.5 and R30.5, located north of the city of Fresno in Fresno County, California. The project proposes to widen Highway 41 to standard width shoulders. To facilitate the widening, a retaining wall is proposed. The wall will cut into an existing embankment, which sits adjacent to an existing basin. This report addresses concerns over the cut into the embankment and the effects from the basin. All recommendations in the original GDR shall remain applicable.

Geotechnical Recommendations

The Office of Geotechnical Design North (OGDN) has reviewed the Herndon Auxiliary Lane project (EA 06-447701 and 06-0E9701) in regards to the proposed retaining wall along Route 41 and the effects of the adjacent basin (Basin "N"). The review documents included the Geotechnical Design Report dated December 8, 2006 and project information and plans provided by District 6 Design.

Borings performed for the GDR indicate that the embankment material consists of medium dense silty sand and loose to medium dense sand. Groundwater was not encountered in Boring B-06-02, which was drilled from the top of the embankment to a depth of 81.5 feet.

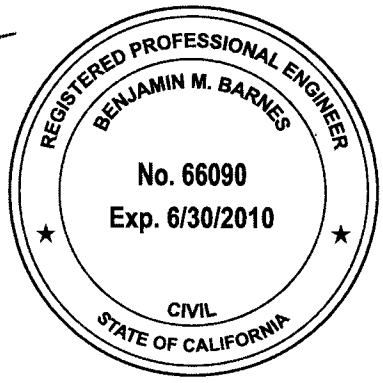
The design of the temporary cut and/or installation of temporary shoring should be the responsibility of the contractor. Any temporary excavations should comply with CAL/OSHA requirements.

This Office makes the following suggestions:

- The global stability of the existing embankment should not be affected by construction of the proposed retaining wall.
- Based upon boring B-06-02, drilled from the top of the embankment, water was not found within the embankment itself. As such, seepage of water into the cut/shore locations is not anticipated. Watertight shoring should not be necessary.
- The existing embankment is stable and sufficient in withstanding the loads caused by water within the basin. If the temporary cut is too shallow, it may encroach very near or into the basin, which may cause instability of the embankment. Therefore, the limit of the temporary shoring/cut should not extend beyond the location of boring B-06-02.
- Based on the type of material encountered in the borings within the embankment, the performance of a temporary cut steeper than 1.5:1 (H:V) may be questionable due to potential surface slipouts.
- If possible, construction of the proposed wall should be constructed when the water level in the basin is at its lowest.
- This Office should have the chance to review the contractors temporary shoring / cut plans prior to construction.

If you have any questions or comments, please contact me at 916-227-1039.

Benjamin M Barnes



BENJAMIN M. BARNES, P.E.
Transportation Engineer – Civil
Geotechnical Design – North

c: Qiang Huang
GDN File
GS File Room

06-Fre-41 (R29.5/R30.5)
Route 41 and Herndon Avenue
EA: 06-447701
District Agreement No. 06-1419

DRAINAGE AGREEMENT

THIS AGREEMENT, ENTERED INTO EFFECTIVE ON 16th March, 2009, is between the STATE OF CALIFORNIA, acting by and through its Department of Transportation, referred to herein as "STATE", and

FRESNO METROPOLITAN FLOOD CONTROL DISTRICT, a sanctioned public authority of the State of California, referred to herein as "FMFCD".

RECITALS

1. STATE and FMFCD, pursuant to Streets and Highways Code Section 2101, are authorized to enter into a Cooperative Agreement for improvements to State Highway System (SHS) within FMFCD's jurisdiction.

2. STATE plans to widen the Herndon Avenue northbound off-ramp and construct an auxiliary lane on northbound State Route (SR) 41, referred to herein as "PROJECT". Said construction will generate additional storm drainage runoff into FMFCD basin "N", shown on Exhibit A, attached hereto and made a part of this Agreement.

3. STATE is willing to make a one time lump sum contribution payment of $6,391.00 to FMFCD based on $6,960 per acre of runoff generated from 0.91 acres of new pavement area.

4. STATE and FMFCD mutually agree that FMFCD will accept the additional storm water generated by PROJECT into FMFCD basin "N".

5. The terms or this Agreement shall supersede any inconsistent terms of any prior Memorandum of Understanding (MOU) or agreement relating to PROJECT.

6. The parties hereto intend to define herein the terms and conditions of the proposed Agreement.

SECTION I

FMFCD AGREES:

1. To invoice STATE upon execution of this agreement the amount of six-thousand three-hundred and ninety-one dollars ($6,391.00).

2. To accept compensation from STATE for the additional storm drainage runoff generated by PROJECT, the one time lump sum payment of $6,391.00.

3. Said compensation shall perpetually relieve STATE of any and all of its obligation to provide additional funds to FMFCD in regards to the storm drainage runoff generated by PROJECT.

4. To allow STATE to discharge the drainage runoff generated from 0.91 acres of new pavement area as a result of PROJECT into FMFCD basin "N", as shown on Exhibit A.

SECTION II

STATE AGREES:

1. To compensate FMFCD within thirty (30) days upon receiving of invoice from FMFCD, the one time lump sum payment of six-thousand three-hundred and ninety-one dollars ($6,391.00). Said compensation shall perpetually relieve STATE of any and all of its obligation to provide additional funds to FMFCD in regards to the storm drainage runoff generated by PROJECT.

SECTION III

IT IS MUTUALLY AGREED:

1. All obligations of STATE under the terms of this Agreement are subject to the appropriation of resources by the Legislature, State Budget Act authority, and the allocation of funds by the California Transportation Commission (CTC).

2. STATE's compensation paid to FMFCD shall perpetually relieve STATE of any and all of its obligation to provide additional funds to FMFCD in regards to the storm drainage runoff generated by PROJECT.

3. Nothing in the provisions of this Agreement is intended to create duties, or obligations to, or rights in, third parties not parties to this Agreement or to affect the legal liability of either party to the Agreement by imposing any standard of care with respect to the development, design, construction, operation or maintenance of State Highways and public facilities different from the standard of care imposed by law.

4. Neither STATE nor any officer or employee thereof is responsible for any injury, damage, or liability occurring by reason of anything done or omitted to be done by FMFCD under or in connection with any work, authority, or jurisdiction arising under this Agreement. It is understood and agreed that FMFCD will fully defend, indemnify, and save harmless STATE and all its officers and employees from all claims, suits, or actions of every name, kind, and description brought forth under, including, but not limited to, tortious, contractual, inverse condemnation, or other theories or assertions of liability occurring by reason of anything done or omitted to be done by FMFCD under this Agreement.

5. Neither FMFCD nor any officer or employee thereof is responsible for any injury, damage, or liability occurring by reason of anything done or omitted to be done by STATE under or in connection with any work, authority, or jurisdiction arising under this Agreement. It is understood and agreed that STATE will fully defend, indemnify, and save harmless FMFCD and all its officers and employees from all claims, suits, or actions of every name, kind, and description brought forth under, including, but not limited to, tortiuous, contractual, inverse condemnation, or other theories or assertions of liability occurring by reason of anything done or omitted to be done by STATE under this Agreement.

6. No alteration or variation of the terms of this Agreement shall be valid unless made by a formal amendment executed by the parties hereto and no oral understanding or agreement not incorporated herein shall be binding on any of the parties hereto.

7. The provisions of this Agreement concerning compensation shall terminate upon final compensation by STATE to FMFCD. All other provisions of the Agreement shall remain in effect until terminated or modified in writing by mutual consent of STATE and FMFCD.

District Agreement No.: 06-1419
EA. 06-447701

STATE OF CALIFORNIA
Department of Transportation

Will Kempton
Director of Transportation

By: _____
for MALCOLM X. DOUGHERTY
District 6 Director

Approved as to Form and Procedure:

By: _____
Attorney
Department of Transportation

Approved as to financial terms and conditions:

By: _____
Accounting Administrator
Reimbursements Section

Certify as to Funds:

By: _____
DESIREE WARD
District 6 Office of Budgets

FRESNO METROPOLITAN FLOOD CONTROL DISTRICT

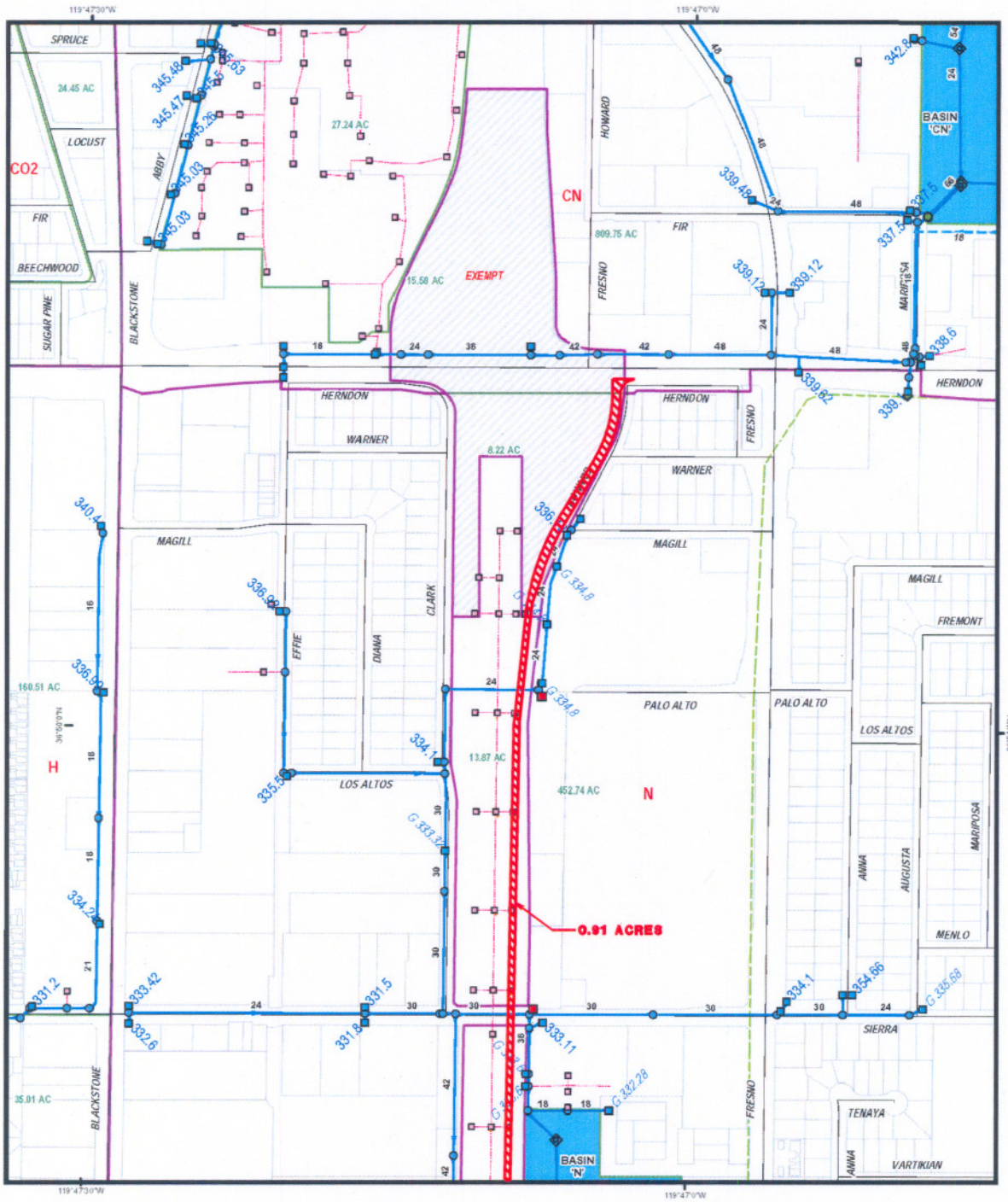
By: _____
BOB VAN WYK
General Manager

Attest:

By: _____
ESTHER SCHWANDT
Clerk to the Board

Approved as to Legal Form:

By: _____
JOHN L.B. SMITH
District's Legal Counsel



SYMBOL LEGEND

- PRIVATE INLET
- DESIGN INLET
- EXISTING INLET
- FUTURE INLET
- FUTURE INLET W/ CONTRACT
- EXISTING MANHOLE
- PRIVATE PIPE
- DESIGN PIPE
- EXISTING PIPE
- FUTURE PIPE
- FUTURE PIPE W/ CONTRACT
- STREET CENTERLINE
- PARCELS
- EXISTING BASIN
- PROPOSED BASIN
- DRAINAGE AREA
- INLET BOUNDARY
- LANDUSE BOUNDARY
- EXISTING TYPE "E" INLET
- PUMP STATION
- EXISTING OUTFALL
- EXISTING TOP OF CURB ELEV
- FUTURE TOP OF CURB ELEV
- EXISTING CURB

FRESNO METROPOLITAN FLOOD CONTROL DISTRICT

STORM DRAINAGE MASTER PLAN

FRESNO COUNTY CALIFORNIA

NORTH

1 " = 400 '

DISTRICT AGREEMENT 06-1419 **EXHIBIT "A"**